APPENDIX 2C-6

July 2005 Consolidated Pre-Meeting Comments

Peer Review of
Proposed Ecological Condition and
Other Relevant Indicators for
EPA's 2006 Report on the Environment

July 19, 2005

Notice:

Pre-meeting comments were prepared by each consultant individually prior to the meeting. They are preliminary comments only, and are used to help consultants become familiar with the document and charge questions, develop the agenda, and identify key issues for discussion. During the meeting, consultants may expand on or change opinions expressed in their pre-meeting remarks and may introduce additional issues. For these reasons, pre-meeting comments should be regarded as preliminary and do not reflect the final conclusions and recommendations of individual consultants. These pre-meeting comments will be included as an appendix in the meeting summary report, along with other background materials.

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Ecological Condition Reviewer Biographies

Steve Bartell
E2 Consulting Engineers, Inc.

Formerly a research scientist in the Environmental Sciences Division at the Oak Ridge National Laboratory, Dr. Steven M. Bartell is currently a Principal Scientist with E2 Consulting Engineers, Inc. and manages the E2 office in Maryville, TN. He is also an adjunct faculty member in the Department of Ecology and Evolutionary Biology at the University of Tennessee, Knoxville. Bartell's education includes a PhD in Oceanography and Limnology (Univ. of Wisconsin 1978), an MS in Botany (plant ecology) (Univ. of Wisconsin 1973), and a BA in Biology (Lawrence University 1971). Dr. Bartell's areas of expertise include systems ecology, ecological modeling, ecological risk analysis, risk-based decision analysis, vulnerability analysis, numerical sensitivity and uncertainty analysis, environmental chemistry, and environmental toxicology. He works with public and private clients in ecological risk assessment, environmental analysis, ecological planning, and ecosystem restoration. Dr. Bartell has conducted ecological risk assessments for a diverse set of environmental stressors: ecological disturbances from commercial navigation on the Upper Mississippi and Illinois Rivers (USACOE); risk of invasive species establishment (USDA); habitat alteration and degradation (USDOE, USACOE); multiple chemical stressors in the Patuxent River and estuary (NOAA, USEPA); radionuclides and toxic metals (several Canadian mining companies); and herbicides and pesticides (Syngenta). Bartell is currently working on large-scale projects in adaptive management and restoration for the Florida Everglades, the Lower Columbia River, and the Upper Mississippi River.

Stanley Gregory
Oregon State University

Stanley Gregory is a Professor in the Department of Fisheries & Wildlife at Oregon State University (Telephone: 541-737-1951; Email:Stanley.Gregory@regonstate.edu). He received his B.S. from the University of Tennessee in 1971, M.S. and Ph.D. from Oregon State University in 1974 and 1980, Oregon State University, Department of Fisheries and Wildlife. Dr. Gregory has been involved in the development of interdisciplinary ecological studies at Oregon State for more than two decades. He has participated in the International Biological Program and the Long-Term Ecological Research Program at the H.J. Andrews Experimental Forest. Dr. Gregory has directed the stream research program informally known as the Stream Team since 1986. This interdisciplinary research program has been recognized for its contributions in teaching and research by the College of Agricultural Sciences, the College of Forestry, and the U.S. Forest Service. His research now includes nutrient dynamics, hyporheic processes, stream and river restoration, wood and habitat relationships, fish assemblages in large rivers, riparian management and restoration, and analysis of alternative future scenarios for large river basins.

George Hepner
University of Utah
Department of Geography

George F. Hepner (www.geog.utah.edu) is a professor of geography at the University of Utah in Salt Lake City, Utah. His major areas of research involve land capability and use analysis using remote sensing and geographic information systems, hazard response and mitigation, and binational environmental assessment on the US/Mexico border.

Since 1986, he has worked periodically as a research fellow and consultant to the Image Processing Laboratory, Cartographic Applications Group at the Jet Propulsion Laboratory, California Institute of Technology. In 1996-97, Hepner worked in the AVIRIS hyperspectral lab at JPL investigating the use of hyperspectral imagery for urban environmental applications. In 1997-98, he was awarded a NASA Center of Excellence grant to establish a center in hyperspectral imagery analysis for environmental monitoring. He was the PI for the Center for the Application of Remote Sensing and GIS to Transportation Hazards at the University of Utah from 2000-2004. This project was supported by the U.S. Department of Transportation. In 2003-2004, Hepner was a research associate at the Lawrence Livermore National Laboratory, where he performed research on the use of spatial analysis in response and mitigation to homeland security incidents.

Hepner served as national President of the American Society for Photogrammetry and Remote Sensing, 2001-2002 (www.asprs.org) and as an editor of the AGU environmental change journal, *Earth Interactions*, 1999-2003 (EarthInteractions.org). Currently, he is Director of the Southwest Center for Environmental Research and Policy at the University of Utah.

Lawrence A. Kapustka, Ph.D.
Golder Associates Ltd.

After receiving a doctorate in botany (1975; emphasis in physiological ecology) Larry taught and did research in various aspects of ecology ranging from molecular genetics through systems ecology. Following 13 years in academia, in 1988, he took a position in the US EPA Corvallis Laboratory (part of the Office of Research and Development). In 1990, he left EPA to form **e**cological **p**lanning and **t**oxicology. Larry is a Certified Senior Ecologist by the Ecological Society of America. He works in the areas of ecological risk assessments, plant ecotoxicology, and ecological applications. For the past several years, he has explored ways of incorporating greater ecological relevance into Ecological Risk Assessment, especially through consideration of landscape ecology and habitat valuation procedures. He chairs the Society of Environmental Toxicology and Chemistry (SETAC) Ecological Risk Assessment Advisory Group; chairs the Subcommittee on Terrestrial Toxicology and Assessment of the American Society of Testing and Materials (ASTM) Biological Effects in the Environmental Fate Committee (E47), and serves on the ASTM Committee on Technical Committee Operations (COTCO).

Comments for Group 1 Indicators

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Attachment 2: Comment Sheet for Group 1 Indicators

Topic Area: **Ecological Condition**
Indicator Name: **Forest Pattern and Fragmentation**

1) Please indicate the extent to which you think the proposed indicator is appropriate, adequate, and useful (AA&U) for evaluating ecological conditions and therefore useful for contributing to an overall picture of ecological conditions.

1	2	3	4
Indicator is not AA&U	Indicator is of somewhat AA&U	Indicator is largely AA&U	Indicator is completely AA&U

Bartell: (2) The analysis represents a snap-shot (ca. 1992) of the status of forest fragmentation. The analysis perhaps provides an indication of the extent forest patterns, but it does not address natural vs anthropogenic sources of fragmentation.

Gregory: (2) Based on 1992 dataset. Trends cannot be established. Assuming that EPA plans to use decadal development of NLCD, broad trends could develop through time, but would require many decades to develop robust trends. A reference condition (e.g., historical forest maps) is needed to determine natural patterns of forest fragmentation from anthropogenic effects.

Hepner: (4) Information on indicator would be improved if a map or regional breakdown of pattern bar graphs were provided. Inventory was circa 1992, so update, especially in areas of high urban land conversion would improve it.

Kapustka: (3) Conceptually, this indicator has great potential to describe status and trends of forests. As described in the brief set of materials available for review, there are numerous problems that render the indicator largely useless for either characterization of condition or as a platform for initiating environmental management practices/formulating environmental management policies.

2) Please indicate the extent to which you think the proposed indicator makes an important contribution to answering the specific ROE question it is intended to answer (see Attachment 1 for list of questions). (Note: An indicator may be judged less important if it makes a smaller or less critical contribution to answering the question posed than the other indicators, or if it covers an area of less or diminishing importance environmentally.)

1	2	3	4
Indicator is not important	Indicator is of minor importance	Indicator is important	Indicator is critical

Bartell: (2)

Gregory: (3) Literature on forest fragmentation and its consequences is extensive. A credible measure of forest fragmentation could provide an array of robust interpretations of its consequences.

Hepner: (3)

Kapustka: (3) Again, there is a major distinction between the utility of the indicator as a construct of ecological structure and function and the execution of that concept as depicted in the supporting discussion. The details proposed for execution of this concept violate many critical ecological features of space and scale as well as ecoregional distinctions. Moreover, there are arbitrary categories proffered with inadequate definitions or justification. If scored as important, this could easily merit a rating of 4; if conducted as described, it should be rated 1. My rating of 3 is based on an assumption that this is "fixable."

3) To what extent do you think the indicator meets the following indicator definition:

> *An "indicator" is* ***a numerical value derived from actual measurements of a pressure, ambient condition, exposure, or human health or ecological condition*** *over a specified geographic domain, whose trends over time represent or draw attention to underlying trends in the condition of the environment.*

1	2	3	4
Doesn't meet the definition	Only partly meets the definition	Largely meets the definition	Fully meets the definition

Please explain:

Bartell: (3)

Gregory: (3) Forest pattern represents ambient condition. If trend data can be developed for forest fragmentation, it would fully meet the indicator definition.

Hepner: (3)

Kapustka: (2) The indicator as described somewhat fails criterion #3(sound collection methods) and absolutely fails criterion #4 in that no trend can be inferred – moreover, the data presented are 15 years old with no indication that the data are to be updated! By making a composite of forests from different areas with decidedly different trends in terms of human uses, even if the first two problems were addressed properly, the indicator would still suffer from the likely situation of one region's increase canceling out another region's decline

4) To what extent do you think the indicator meets each of the following indicator criteria:

a) The indicator makes an important contribution to answering a question for the ROE. (In this context, "important" means that the indicator answers a substantial portion of and/or a critical part of the question.)

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (2)
Gregory: (3)
Hepner: (3)
Kapustka: (2)

b) The indicator is objective. It is developed and presented in an accurate, clear, complete, and unbiased manner.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (3)
Gregory: (3)
Hepner: (2)
Kapustka: (2)

c) The underlying data are characterized by sound collection methodologies, data management systems that protect its integrity, and quality assurance procedures.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (3)
Gregory: (3)
Hepner: (3)
Kapustka: (2)

d) Data are available to describe changes or trends, and the latest available data are timely.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (2)
Gregory: (1)
Hepner: (2)
Kapustka: (2)

e) The data are comparable across time and space, and representative[1] of the target population. Trends depicted in this indicator accurately represent the underlying trends in the target population.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (2)
Gregory: (2)
Hepner: (3)
Kapustka: (1)

f) The indicator is transparent and reproducible. The specific data used and the specific assumptions, analytic methods, and statistical procedures employed are clearly stated.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (3)
Gregory: (4)
Hepner: (2)
Kapustka: (3)

Please explain:

Bartell: [no answer provided]

Gregory: According to the description of limitations, this measure will be determined solely from the 1992 NLCD. As such, it cannot describe trends. Satellite spectral data are widely available and the resolution is rapidly becoming finer. The forest fragmentation index could be developed from such data, but strict adherence to protocols and classification algorithms would be necessary to produce consistent and comparable assessments through time.

Hepner: This indicator is derived from the combination of several measures and methodological decisions which could be challenged. However, the steps to derive the indicator are defined and not ambiguous, reproducible, and among the better available. The amounts and geographic pattern of forest cover and fragmentation are indicative of the status of other ecological conditions.

Kapustka: However, transparency and reproducibility do not overcome the fatal flaws of the indicator as described above.

[1] An indicator seeks to describe trends in an overall target "population" (e.g., land area, type of surface water, type of emissions, U.S. population), yet data often can only be sampled from a subset of this population. The validity of the trends described by the indicator will depend on the degree to which the sampled population is representative of the target population.

5) Do you have any suggestions for more effective graphic presentation of the data? If yes, please describe.

Bartell: Not sure about the basis for the selected "window" sizes...not sure all windows are needed. Certainly as the window size increases, the percentage of surrounding land that is forested would be expected to decrease (i.e., Fig. 110-1).

Gregory: The data could be compared to a peer-reviewed reference for forest condition prior to Euro-American settlement (examples can be found in Williamson and others). Change from a reference condition can be represented readily in graphical illustration. Several regional examples have been completed (Willamette River Basin, San Pedro River Basin, Central Michigan).

Hepner: Instead of national level bar graphs, break it down to regions or provide a map of the fragmentation categories.

Kapustka: After the points addressed in my response below (question 6), at a minimum, the data needs to be separated by ecoregions in order to avoid the masking effect of one region canceling the trend of another region. Alternatively, some weighting relationship among regions and types of forest need to be incorporated into the summary graphics.

6) Please provide any additional comments, suggestions, or concerns regarding the indicator that you have not already noted in Questions 1 through 5. In particular, note any limitations to the indicator that you have not already described in your responses to the preceding questions.

Bartell: Despite the limitations, there are no other indicators used in attempt to describe the condition, status, trends, etc. of the Nation's forested lands. The current indicator should be retained in future ROE's.

Gregory: None

Hepner: [no answer provided]

Kapustka: What is the rationale behind the series 5, 9, 27, 81, 243? if the last four values are reasonable, then why not start with 3? If 5 is a good start, then why not proceed to some multiplier of 5?

What is the underlying reason for the categories of surrounding forest at least 90%? 60%? Unless there is a strong case history behind these values, then it is imperative that sensitivity analyses be performed to examine the effects of selecting these break points.

The units should also be expressed in metric values not acres.

7) Overall, this indicator:

Bartell: ___X__ Should be included in ROE06 TD.

Gregory: _**XXX**_ Should be included in ROE06 TD with the modifications identified above

Hepner: ___ **X** __ Should be included in ROE06 TD.

Kapustka: _X__ Should be included in ROE06 TD with the modifications identified above.

Attachment 2: Comment Sheet for Group 1 Indicators

Topic Area: **Ecological Condition**
Indicator Name: **Extent of Coral Reef Cover**

1) Please indicate the extent to which you think the proposed indicator is appropriate, adequate, and useful (AA&U) for evaluating ecological conditions and therefore useful for contributing to an overall picture of ecological conditions.

1	2	3	4
Indicator is not AA&U	Indicator is of somewhat AA&U	Indicator is largely AA&U	Indicator is completely AA&U

Bartell: (2)

Gregory: (2) The limited geographic extent and heterogeneity of the data raise significant question about how representative the data are for coral reef systems of the U.S.

Hepner: (2) I believe that coral reefs are critical indicators of marine ecosystems, but in this case, the data are too limited and not aligned with the areal extent of other indicators to be adequate and useful. The indicator is for a limited number of sites of hard coral only in U.S. Caribbean areas. This is not comparable to other indicators that reflect larger portions of the contiguous US.. Hawaiian coral reefs are not included.

Kapustka: (2) There is little debate that coral reefs represent important ecosystems that support many valued resources. The case is not made sufficiently strong that the fraction of the world's coral reefs reside in the US waters in the Gulf –why not include Hawaii? As with many of the "indicators" presented in the package, this one is a collection of loosely related studies that had different objectives and used different data collection methods. There is insufficient information presented to establish comparability among the different methods. Most important, there was no indication that the studies would be continued beyond the year 2002. Therefore, this becomes another "one-off" analysis of condition that with no plans to undertake longitudinal studies to document the validity of the projected trend.

2) Please indicate the extent to which you think the proposed indicator makes an important contribution to answering the specific ROE question it is intended to answer (see Attachment 1 for list of questions). (Note: An indicator may be judged less important if it makes a smaller or less critical contribution to answering the question posed than the other indicators, or if it covers an area of less or diminishing importance environmentally.)

1	2	3	4
Indicator is not important	Indicator is of minor importance	Indicator is important	Indicator is critical

Bartell: (3)

Gregory: (3) Coral reefs are a critical ecosystem and it is important to develop a credible measure of this sensitive ecosystem.

Hepner: (2)

Kapustka: (2) As described, it does not relate to any specific situation that might be addressed either through management or policy.

3) To what extent do you think the indicator meets the following indicator definition:

An "indicator" is ***a numerical value derived from actual measurements of a pressure, ambient condition, exposure, or human health or ecological condition*** *over a specified geographic domain, whose trends over time represent or draw attention to underlying trends in the condition of the environment.*

1	2	3	4
Doesn't meet the definition	Only partly meets the definition	Largely meets the definition	Fully meets the definition

Please explain:

Bartell: (3) The attempted synthesis of the 79 studies produced estimates of percent hard coral cover from 1973 to 2002. Without repeating the entire analysis, it remains difficult to determine the overall quality of the analyses and the reliability of the data presented in Figure 1. Inspection of the data suggests that higher values occurred in the earlier part of the time series, while lower percentages characterize the latter years. However, without some presentation of error terms or even a simple (maybe inappropriate) regression analysis, it is difficult to come to a solid conclusion of a significant trend in cover based on the data points in the figure.

Gregory: (2) The limited geographic extent and heterogeneity of the data raise significant question about how representative the data are for coral reef systems of the U.S.

Hepner: (2)

Kapustka: (2) If adequate work were performed to relate alternative methods, some value could be derived from this indicator. There would also need to be a plan to continue to monitor the condition so that variability could be characterized and so that trends could be charted spatially and temporally.

4) To what extent do you think the indicator meets each of the following indicator criteria:

a) The indicator makes an important contribution to answering a question for the ROE. (In this context, "important" means that the indicator answers a substantial portion of and/or a critical part of the question.)

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (3)
Gregory: (3)
Hepner: (2)
Kapustka: (2)

b) The indicator is objective. It is developed and presented in an accurate, clear, complete, and unbiased manner.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (2)
Gregory: (3)
Hepner: (2)
Kapustka: (1)

c) The underlying data are characterized by sound collection methodologies, data management systems that protect its integrity, and quality assurance procedures.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (2)
Gregory: (2)
Hepner: (3)
Kapustka: (2)

d) Data are available to describe changes or trends, and the latest available data are timely.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (3)
Gregory: (3)
Hepner: (3)
Kapustka: (2)

e) The data are comparable across time and space, and representative[2] of the target population. Trends depicted in this indicator accurately represent the underlying trends in the target population.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (2)
Gregory: (3)
Hepner: (2)
Kapustka: (2)

f) The indicator is transparent and reproducible. The specific data used and the specific assumptions, analytic methods, and statistical procedures employed are clearly stated.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (2)
Gregory: (3)
Hepner: (2)
Kapustka: (1)

Please explain:

Bartell: As described, the synthesis of the 79 studies is somewhat limited in its geographical extent and includes different data types (e.g., quadrats, transects) and sampling methods. It might prove somewhat difficult to reconstruct the analysis. Without reviewing all of the studies and the synthesis, it is difficult to determine the exact value or utility of Figure 1 in assessing a quantitative trend in coral reef cover – even though general opinion and public perception is that coral resources are diminishing on a global scale.

Gregory: The data include a mix of transect and quadrat data. Sample bias sgould be explored thoroughly and used to correct for methodological biases. Data only go back to early 1970s, therefore this measure only depicts recent trends. Other types of reefs systems and many hard coral reefs are not included.

Hepner: Since the data are from 79 study sites spread throughout the Caribbean, using various methodologies, replication if doubtful. What criteria were used to select the sample sites?

Use of Hawaiian data would make more indicative of US coastal areas.

[2] An indicator seeks to describe trends in an overall target "population" (e.g., land area, type of surface water, type of emissions, U.S. population), yet data often can only be sampled from a subset of this population. The validity of the trends described by the indicator will depend on the degree to which the sampled population is representative of the target population.

Kapustka: The reason this is not transparent or reproducible is that multiple studies involving multiple investigators with different collection methods are not amenable to the normal expectations of QA/QC that would provide unambiguous opportunities for repeated sampling.

5) Do you have any suggestions for more effective graphic presentation of the data? If yes, please describe.

Bartell: There are statistical problems inherent to using data expressed as percentages. Nevertheless, some presentation of ranges, error bars, etc. might make the presentation in Figure 1 more compelling. At the same time, inclusion of error bars for all the data points might make this figure difficult to inspect. Hence, some form of trend analysis based on the percentages might be instructive and add value to this indicator.

Gregory: Temporal trends or time series analysis needs to be represented in the scatter plot. The intervals between samples are not clear from the graph.

Hepner: The graphic portraying the hard coral cover could be improved. It is difficult to discern that these points represent different sample sites rather than change in cover of same sites over time. More information in the caption is needed to explain the meaning of the data points and the trend.

Kapustka: Show the consequences of eliminating the two initial points on the "trend." Demonstrate the equivalency of alternative methods.
Identify the likely error terms among the different investigators. All studies I am aware of in which careful cross-training has not been performed to eliminate observer bias show that huge discrepancies arise. Until this error can be accounted for, one could easily show that no trend has been demonstrated.

6) Please provide any additional comments, suggestions, or concerns regarding the indicator that you have not already noted in Questions 1 through 5. In particular, note any limitations to the indicator that you have not already described in your responses to the preceding questions.

Bartell: [no answer provided]

Gregory: [no answer provided]

Hepner: [no answer provided]

Kapustka: Were there no studies that re-sampled the same reef? If not, then before proposing this indicator, undertake a study to re-sample selected sites with the different methods.

7) Overall, this indicator:

Bartell: __X___ Should be included in ROE06 TD.

Gregory: **_XXX_** Should be included in ROE06 TD with the modifications identified above.

Hepner: __ **X** ___ Should be included in ROE06 TD with the modifications identified above.

Kapustka: _X__ Should *not* be included in ROE06 TD.

Attachment 2: Comment Sheet for Group 1 Indicators

Topic Area: **Ecological Condition**
Indicator Name: **Ecological Framework**

1) Please indicate the extent to which you think the proposed indicator is appropriate, adequate, and useful (AA&U) for evaluating ecological conditions and therefore useful for contributing to an overall picture of ecological conditions.

1	2	3	4
Indicator is not AA&U	Indicator is of somewhat AA&U	Indicator is largely AA&U	Indicator is completely AA&U

Bartell: (3)

Gregory: (2) Aggregation of many measures provides breadth but obscures specific responses. Difficult to interpret.

Hepner: (4) This indicator is based on integrative analysis that combines several ecological measures, which are founded on numerous data sets. The results provide understandable information for a significant portion of the US, which can be applied to other regions.

Kapustka: (2) This indicator is fuzzy on several counts. Most troubling is that it posits an attribute (integrity) that is not a property of ecological systems. (Note that many early papers in ecology, *integrity* was discussed and it is offered up more recently in the IBI. However, critical papers have argued effectively that *integrity* is meaningless in ecology.) Similarly, *health* is not an attribute of ecological systems. The actual attributes that form the basis of the graphics can be cast without invoking integrity, but the case has not been made. Moreover, there are many critical aspects of this indicator that are not described adequately (e.g., what parameters were used to generate biodiversity or ecosystem services). And how could the features presented here be expanded to a national indicator. This and the following indicators in this section appear to be regional pilot studies, rather than something ready for adoption on a national scale.

2) Please indicate the extent to which you think the proposed indicator makes an important contribution to answering the specific ROE question it is intended to answer (see Attachment 1 for list of questions). (Note: An indicator may be judged less important if it makes a smaller or less critical contribution to answering the question posed than the other indicators, or if it covers an area of less or diminishing importance environmentally.)

1	2	3	4
Indicator is not important	Indicator is of minor importance	Indicator is important	Indicator is critical

Bartell: (3)

Gregory: (3)

Hepner: (3) Because the ecological framework is a more comprehensive indicator of ecological conditions, it is important to include in the ROE.

Kapustka: (3) Apart from the erroneous formulations of integrity, the actual measurements would have considerable value in characterizing status and trends of ecological conditions related to provision of desired ecological services. In its current form, however, it really has only minor importance (2) – my assignment of 3 is driven by potential to be a useful indicator.

3) To what extent do you think the indicator meets the following indicator definition:

*An "indicator" is **a numerical value derived from actual measurements of a pressure, ambient condition, exposure, or human health or ecological condition** over a specified geographic domain, whose trends over time represent or draw attention to underlying trends in the condition of the environment.*

1	2	3	4
Doesn't meet the definition	Only partly meets the definition	Largely meets the definition	Fully meets the definition

Please explain:

Bartell: (3)

Gregory: (2) Combination of measures and broad classes of landscape elements makes it difficult to interpret underlying trends in the condition of the environment.

Hepner: (4) The EF utilizes measures of land use change, ecosystem productivity, ecosystem importance and connectivity, and biodiversity. Therefore, it provides multi-factor information on ecological conditions and trends for the SE US.

Kapustka: (2) The indicator fails on several levels, most notably, it is regional instead of national. The underlying data in this presentation is limited to 1992-1993. IF the descriptions are correct, there should be data from 1998-1999 and again in 2006-2007 at least at for Region 4. Does it take too much time/money to process the data? Why hasn't something been done to expand the approach to a national level?

4) To what extent do you think the indicator meets each of the following indicator criteria:

a) The indicator makes an important contribution to answering a question for the ROE. (In this context, "important" means that the indicator answers a substantial portion of and/or a critical part of the question.)

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (3)
Gregory: (3)
Hepner: (3)
Kapustka: (2) What exactly is the ecological framework?

b) The indicator is objective. It is developed and presented in an accurate, clear, complete, and unbiased manner.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (3)
Gregory: (2)
Hepner: (3)
Kapustka: (2) The construct as presented has several imbedded values that have not been vetted (e.g., critical landscapes, integrated habitat networks, priority ecological areas); each is contextual and the context is not described.

c) The underlying data are characterized by sound collection methodologies, data management systems that protect its integrity, and quality assurance procedures.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (3)
Gregory: (2)
Hepner: (2)
Kapustka: (2) The introductory section mentions 9 data layers for biodiversity and seven data layers for ecosystem services, but these are not identified, so it could not be replicated or evaluated in terms QA).

d) Data are available to describe changes or trends, and the latest available data are timely.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (3)
Gregory: (2)
Hepner: (3)

Kapustka: (1) Apparently not, in that only the 1992-1993 data are presented. It is either too involved to synthesize/analyze the data or there is little interest in doing so, clearly it is not timely.

e) The data are comparable across time and space, and representative[3] of the target population. Trends depicted in this indicator accurately represent the underlying trends in the target population.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (3)
Gregory: (3)
Hepner: (3)
Kapustka: (1) Not so either through time or beyond Region 4.

f) The indicator is transparent and reproducible. The specific data used and the specific assumptions, analytic methods, and statistical procedures employed are clearly stated.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (3)
Gregory: (2)
Hepner: (2)
Kapustka: (2) Inadequate explanations are given to permit replication of the characterization.

Please explain:

Bartell: The EF and its components seem to be useful summaries of complex spatial patterns in ecosystem form and function. The methods seem workably transparent and objective. Subsequent analysis of the 2002 NLCD should permit the EF to characterize trends. The current major limitation lies in its application to only Region 4.

Gregory: Methods are still being developed. Lack of resolution at finer spatial extents makes applications limited. Mix of sources of remotely-sensed information present challenges for integration and interpretation. Unclear how the measure would be broadly applied to the U.S.

Hepner: Qualifications on meeting the criterion are for items c and f. The indicator is based on the combination and integration of various data in a geographically-referenced frame using a geographic information system (GIS). Accuracy of data can be assessed statistically for single

[3] An indicator seeks to describe trends in an overall target "population" (e.g., land area, type of surface water, type of emissions, U.S. population), yet data often can only be sampled from a subset of this population. The validity of the trends described by the indicator will depend on the degree to which the sampled population is representative of the target population.

data sets, such as the NLCD, but the current state of the art cannot assess error propagation through multiple dataset combinations and modeling, as is done using a GIS in this indicator. Reproduction of complex factor prioritizations, reclassifications, multiple utility assignments and spatial analysis decisions would be difficult to reproduce precisely even with good documentation.

Kapustka: [see above]

5) Do you have any suggestions for more effective graphic presentation of the data? If yes, please describe.

Bartell: The spatial nature of the analyses supports the current presentation of the EF results (Figs 308R-1 through 308R-5). At the same time, the similarity in the patterns of results shown in these figures hints at some redundancy in the kinds of information included in the various components of the EF.

Gregory: Maps are useful, but graphical quantitative data are needed also. Frequency distributions for different measures would be useful.

Hepner: [no answer provided]

Kapustka: Do a better job of choosing display colors that are distinguishable from one another.

6) Please provide any additional comments, suggestions, or concerns regarding the indicator that you have not already noted in Questions 1 through 5. In particular, note any limitations to the indicator that you have not already described in your responses to the preceding questions.

Bartell: [no answer provided]

Gregory: [no answer provided]

Hepner: [no answer provided]

Kapustka: Process the 1998-1999 data for the region and describe the availability of similar data on a national scale.

Lose the discussions of integrity and health.

Be explicit regarding habitats (for which species). Explain why they were selected.

7) Overall, this indicator:

Bartell: __X___ Should be included in ROE06 TD.

Gregory: **_XXX_** Should be included in ROE06 TD with the modifications identified above

Hepner: ___ **X** __ Should be included in ROE06 TD.

Kapustka: __X__ Should be included in ROE06 TD with the modifications identified above.

Attachment 2: Comment Sheet for Group 1 Indicators

Topic Area: **Ecological Condition**
Indicator Name: **Relative Ecological Condition of Undeveloped Land**

1) Please indicate the extent to which you think the proposed indicator is appropriate, adequate, and useful (AA&U) for evaluating ecological conditions and therefore useful for contributing to an overall picture of ecological conditions.

1	2	3	4
Indicator is not AA&U	Indicator is of somewhat AA&U	Indicator is largely AA&U	Indicator is completely AA&U

Bartell: (3)

Gregory: (2) This indicator is limited to Region 5. It is additional complicated because it is an aggregate of several indices, therefore making explicit interpretation difficult. It is not clear what is meant by "ecosystem condition" and the relative weighting of terrestrial and aquatic ecosystems within the region. Also, the indicator requires much additional work to make it extend more than one decade. No evidence of historical references were provided. The finest resolution (300 m X 300 m) is still relatively coarse.

Hepner: (2) The indicator is an integrative measure of the condition and, therefore, implied potential of undeveloped land in the upper Midwest of the US.

Kapustka: (3) This indicator as with others has the potential of providing a useful synthesis of large-scale land use patterns that could become the basis for environmental management decisions or policy formulations. In current form, it is unclear on several points. It also suffers from a restricted regional focus with apparently little opportunity for expansion to a national scale.

2) Please indicate the extent to which you think the proposed indicator makes an important contribution to answering the specific ROE question it is intended to answer (see Attachment 1 for list of questions). (Note: An indicator may be judged less important if it makes a smaller or less critical contribution to answering the question posed than the other indicators, or if it covers an area of less or diminishing importance environmentally.)

1	2	3	4
Indicator is not important	Indicator is of minor importance	Indicator is important	Indicator is critical

Bartell: (3)

Gregory: (2 or slightly 3)

Hepner: (3) Understanding the ecological condition of undeveloped land provides useful trend information on land use change and is related to maintenance of open space and ecosystem sustainability.

Kapustka: (3) If deficiencies can be corrected, it could be an important indicator – currently it has only minor value.

3) To what extent do you think the indicator meets the following indicator definition:

An "indicator" is ***a numerical value derived from actual measurements of a pressure, ambient condition, exposure, or human health or ecological condition*** *over a specified geographic domain, whose trends over time represent or draw attention to underlying trends in the condition of the environment.*

1	2	3	4
Doesn't meet the definition	Only partly meets the definition	Largely meets the definition	Fully meets the definition

Please explain:

Bartell: (3)

Gregory: (2) This indicator is limited to Region 5. It is additional complicated because it is an aggregate of several indices, therefore making explicit interpretation difficult. It is not clear what is meant by "ecosystem condition" and the relative weighting of terrestrial and aquatic ecosystems within the region. Also, the indicator requires much additional work to make it extend more than one decade. No evidence of historical references were provided. The finest resolution (300 m X 300 m) is still relatively coarse.

Hepner: (3)

Kapustka: (2) The input data for diversity are identified as relative diversities. It would be much more useful to present primary data to avoid the ambiguity that can arise from normalizing disparate inputs. If primary data are used, it is possible to display both absolute and relative values; by limiting the display to relative, one cannot deconstruct this to show patterns of the absolute values.

4) To what extent do you think the indicator meets each of the following indicator criteria:

a) The indicator makes an important contribution to answering a question for the ROE. (In this context, "important" means that the indicator answers a substantial portion of and/or a critical part of the question.)

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (3)
Gregory: (2)
Hepner: (2)
Kapustka: (2)

b) The indicator is objective. It is developed and presented in an accurate, clear, complete, and unbiased manner.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (3)
Gregory: (3)
Hepner: (2)
Kapustka: (2)

c) The underlying data are characterized by sound collection methodologies, data management systems that protect its integrity, and quality assurance procedures.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (3)
Gregory: (2)
Hepner: (3)
Kapustka: (2) The summation step resulting in a potential range from 0 to 300 appears to have a logic flaw in that a score of 300 could be obtained only if the cover was both rare and intact (un-fragmented over a relatively large area) which are measures of opposing conditions.

d) Data are available to describe changes or trends, and the latest available data are timely.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (2)
Gregory: (2)
Hepner: (3)
Kapustka: (2) Possibly, but the trend analyses has yet to be complete despite being three to four years old.

e) The data are comparable across time and space, and representative[4] of the target population. Trends depicted in this indicator accurately represent the underlying trends in the target population.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (2)
Gregory: (2)
Hepner: (3)
Kapustka: (2) Potentially temporal and spatial trends could be developed, but have not been demonstrated as of yet.

f) The indicator is transparent and reproducible. The specific data used and the specific assumptions, analytic methods, and statistical procedures employed are clearly stated.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (3)
Gregory: (3)
Hepner: (2)
Kapustka: (3) Additional explanations of first derivatives and consequences of different category boundaries would be highly desirable.

Please explain:

Bartell: The analyses, based on classification of the NLCD, offers the opportunity for objective and repeatable analyses of spatial patterns, distribution, and extent of various undeveloped lands in Region 5. The limitations, as indicated in the description, pertain to the relative nature of the comparisons (i.e., ranking within ecoregions) and the resolution of the individual cells. The suitability of this indicator for assessing trends depends on validation of the methods (summer 2005 studies) and the availability of future NLCD data.

Gregory: Methodological limitations (grain, composite index, data sources) and developmental nature make it promising but not currently adequate to be applied broadly. The lack of substantial trend capability also limit its utility as an indicator.

Hepner: [no answer provided]

Kapustka: [see above]

[4] An indicator seeks to describe trends in an overall target "population" (e.g., land area, type of surface water, type of emissions, U.S. population), yet data often can only be sampled from a subset of this population. The validity of the trends described by the indicator will depend on the degree to which the sampled population is representative of the target population.

5) Do you have any suggestions for more effective graphic presentation of the data? If yes, please describe.

Bartell: It would be useful to see some presentation (maps) or summary (tables) of the distribution and extent of the three components of the overall composite score.

Gregory: The meaning of the scores is unclear. Therefore the graphics and use of colors are also difficult to interpret. The frequency distribution is useful but still limited by the ability to interpret scores.

Hepner: The indicator has some of the same strengths and limitations as other integrative measures. In this case, the value lies in that several environmental parameters are combined to yield a multi-dimensional indicator. However, as with all composite indexes, the initial parameter numericalization and later factor weighting are problematic methodological issues. For example, this indicator is based on three composite criteria, of which all three are given equal weight in the final index.

The geographic spatial issues of this indicator, like others, are problematic as well. The geographic scale of the data collection and the levels of spatial aggregation are not addressed. As noted in other similar indicators, error propagation is not understood when multiple layers of mapped information are combined.

These issues may be rectifiable, or at least be dealt with by qualifying and limiting conclusions to certain levels of scale or ecological generalization.

Kapustka: Choose a color scheme that grades across categories; especially change either the orange or the red as they are almost indistinguishable.

6) Please provide any additional comments, suggestions, or concerns regarding the indicator that you have not already noted in Questions 1 through 5. In particular, note any limitations to the indicator that you have not already described in your responses to the preceding questions.

Bartell: Efforts might be undertaken to compare/contrast this indicator with the Ecological Framework. There might be an opportunity to integrate the two measures (Both based on analysis of the NLCD) and derive a common indicator that can be more broadly applied than merely across the separate applications to Regions 4 and 5.

Gregory: [no answer provided]

Hepner: [no answer provided]

Kapustka: The authors of this write-up would do well to summarize the keep points of various reports that are cited as being on line. There simply isn't enough time in this review process to pursue each of the web pages to find the relevant parts of the documents.

Also, the statement that computational limitations exist appears to be more of a statement of resolve than of technical limitations. Were this deemed important enough, surely there is sufficient computing power on the super computers to blast through these data.

7) Overall, this indicator:

Bartell: __X__ Should be included in ROE06 TD.

Gregory: _**XXX**_ Should *not* be included in ROE06 TD.

Hepner: __**X**___ Should be included in ROE06 TD with the modifications identified above.

Kapustka: __X___ Should be included in ROE06 TD with the modifications identified above.

Attachment 2: Comment Sheet for Group 1 Indicators

Topic Area: **Ecological Condition**
Indicator Name: **Land Cover Change in Puget Sound Basin**

1) Please indicate the extent to which you think the proposed indicator is appropriate, adequate, and useful (AA&U) for evaluating ecological conditions and therefore useful for contributing to an overall picture of ecological conditions.

1	2	3	4
Indicator is not AA&U	Indicator is of somewhat AA&U	Indicator is largely AA&U	Indicator is completely AA&U

Bartell: (2) Major limitation concerns the relatively small geographical extent addressed by this indicator.

Gregory: (2) The use of three metrics---urban, ag, and forest---limits its application. This is a coarse resolution representation of land use change. The broad ecological consequences of these three land use offer very general interpretations and the interpretations change across the United States with different land uses.

Hepner: (4) Conversion of land is a critical issue related to ecosystem maintenance, urban growth and water quality. This indicator addresses this issue in a straightforward manner, understandable to most. While it is not as complex as some indicators it is adequate to convey useful information.

Kapustka: (3) Among the indicators described to this point, this is the first that has presented a cogent discussion of the indicator, how it is measured/analyzed, and how it is used without lots of superfluous fluff. This indicator suffers only from the fact that it is restricted to a narrowly defined regional area instead of being a nation-wide indicator.

2) Please indicate the extent to which you think the proposed indicator makes an important contribution to answering the specific ROE question it is intended to answer (see Attachment 1 for list of questions). (Note: An indicator may be judged less important if it makes a smaller or less critical contribution to answering the question posed than the other indicators, or if it covers an area of less or diminishing importance environmentally.)

1	2	3	4
Indicator is not important	Indicator is of minor importance	Indicator is important	Indicator is critical

Bartell: (2)

Gregory: (2)

Hepner: (3)

Kapustka: (3) This is an excellent indicator, but it needs to be applied nationally.

3) To what extent do you think the indicator meets the following indicator definition:

An "indicator" is ***a numerical value derived from actual measurements of a pressure, ambient condition, exposure, or human health or ecological condition*** *over a specified geographic domain, whose trends over time represent or draw attention to underlying trends in the condition of the environment.*

1	2	3	4
Doesn't meet the definition	Only partly meets the definition	Largely meets the definition	Fully meets the definition

Please explain:

Bartell: (3)

Gregory: (3) The indicator is a measure of human pressure on the landscape.

Hepner: (3)

Kapustka: (4) This indicator uses direct measures over time that details important patterns of landuse.

4) To what extent do you think the indicator meets each of the following indicator criteria:

a) The indicator makes an important contribution to answering a question for the ROE. (In this context, "important" means that the indicator answers a substantial portion of and/or a critical part of the question.)

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (2)
Gregory: (3)
Hepner: (3)
Kapustka: (3) The primary deficiency is the regional restrictiveness of the data.

b) The indicator is objective. It is developed and presented in an accurate, clear, complete, and unbiased manner.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (3)
Gregory: (2)
Hepner: (3)
Kapustka: (4)

c) The underlying data are characterized by sound collection methodologies, data management systems that protect its integrity, and quality assurance procedures.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (2)
Gregory: (3)
Hepner: (3)
Kapustka: (4)

d) Data are available to describe changes or trends, and the latest available data are timely.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (None)
Gregory: (3)
Hepner: (3)
Kapustka: (3) This could easily score 2 because of the regional restrictiveness, but the fact that it contains a temporal component elevates this one above other indicators.

e) The data are comparable across time and space, and representative[5] of the target population. Trends depicted in this indicator accurately represent the underlying trends in the target population.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (2)
Gregory: (2)
Hepner: (3)
Kapustka: (3) Same critique as above.

[5] An indicator seeks to describe trends in an overall target "population" (e.g., land area, type of surface water, type of emissions, U.S. population), yet data often can only be sampled from a subset of this population. The validity of the trends described by the indicator will depend on the degree to which the sampled population is representative of the target population.

f) The indicator is transparent and reproducible. The specific data used and the specific assumptions, analytic methods, and statistical procedures employed are clearly stated.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (3)
Gregory: (3)
Hepner: (3)
Kapustka: (4) For the region involved, but not clear what would happen on a national scale.

Please explain:

Bartell: References to publications suggest that the methods are objective, sound, and repeatable. There is some concern regarding the public availability of the data. A considerable discontinuity exists between the time frame of data analysis for the US and Canadian portions of the Puget Sound Basin.

Gregory: Land uses differ widely across the US. Interpretation of coarse land use categories are compromised by high variability in the functional links or ecological responses to broad categories of land use.

Hepner: Title of indicator maps involve change in land cover. Legend describes change in related land use related to cover. This issue is handled in T1Q3 of the QA/QC. For example, what is definition of urbanization? Is in structure density, amount of impervious surface, tree crown density? Are these the best composite metrics? I doubt that these same means of reconciling cover and use would be effective in other regions of the US without modification.

Kapustka: [see above]

5) Do you have any suggestions for more effective graphic presentation of the data? If yes, please describe.

Bartell: Simple X-Y plots of trends of the different land covers for different scales of watershed aggregation might help present the results of these analyses.

Gregory: [no answer provided]

Hepner: Maps should be created that indicate the original cover/use for those areas undergoind land cover/use change Perhaps a two color maps or more maps showing areas that changed from forest to agriculture, forest to urban, agriculture to urban, and agriculture to forest.

Kapustka: [no answer provided]

6) Please provide any additional comments, suggestions, or concerns regarding the indicator that you have not already noted in Questions 1 through 5. In particular, note any limitations to the indicator that you have not already described in your responses to the preceding questions.

Bartell: [no answer provided]

Gregory: [no answer provided]

Hepner: [no answer provided]

Kapustka: Expand to a national scale.

7) Overall, this indicator:

Bartell: __X__ Should be included in ROE06 TD

Gregory: _**XXX**_ Should *not* be included in ROE06 TD.

Hepner: ___**X**__ Should be included in ROE06 TD.

Kapustka: _X__ Should be included in ROE06 TD with the modifications identified above.

Attachment 2: Comment Sheet for Group 1 Indicators

Topic Area: **Ecological Condition**
Indicator Name: **Terrestrial Plant Growth Index**

1) Please indicate the extent to which you think the proposed indicator is appropriate, adequate, and useful (AA&U) for evaluating ecological conditions and therefore useful for contributing to an overall picture of ecological conditions.

1	2	3	4
Indicator is not AA&U	Indicator is of somewhat AA&U	Indicator is largely AA&U	Indicator is completely AA&U

Bartell: (2)

Gregory: (2) NDVI is a crude measure of growth. Future of NDVI is uncertain. High variance of 13-yr record makes interpretation questionable. Methodological problems are numerous and largely unanswered.

Hepner: (1) The results are too ambiguous and not explained or, perhaps, explainable. If you cannot interpret the trends in the indicator with logical scientific process explanations, then it is a valid scientific question, but not a public environmental indicator.

Kapustka: (2) There are several problems in the description that may be more related to condensing the work of the Heinz Foundation report than actual problems with the index. On face value, this conceptual theme should be one that scores 4. However, multiple questions arise regarding the choice of political boundaries (counties) instead of a more science based delineation of the landscape; undefined terms (e.g. Normalized Difference Vegetation Index), and some truly outlandish claims (e.g. year-to-year fluctuations up to 40%) being passed off as inconsequential. Note that in the acid rain program, effects on NPP purported to occur in the range of 1% or less were presented as strong indications of major impacts. Similarly, projections of likely consequences of global climate change are based on annual changes of ~1%. Can an indicator that fluctuates some 40% ever help to understand consequences of such subtle annual shifts? Are there any efforts to ground-truth the remotely sensed projections? Clearly, this is not ready to be used to characterize trends in plant growth.

2) Please indicate the extent to which you think the proposed indicator makes an important contribution to answering the specific ROE question it is intended to answer (see Attachment 1 for list of questions). (Note: An indicator may be judged less important if it makes a smaller or less critical contribution to answering the question posed than the other indicators, or if it covers an area of less or diminishing importance environmentally.)

1	2	3	4
Indicator is not important	Indicator is of minor importance	Indicator is important	Indicator is critical

Bartell: (2) The relative deviation of the Plant Growth Index (20-40%) without explanation during the period of analysis suggests that the indicator might lack the precision needed to assess national trends in productivity.

Gregory: (2)

Hepner: (2)

Kapustka: (3) This should be one of most useful indicators, but clearly as described under 1 above, there are many critical issues to be addressed.

3) To what extent do you think the indicator meets the following indicator definition:

An "indicator" is ***a numerical value derived from actual measurements of a pressure, ambient condition, exposure, or human health or ecological condition*** *over a specified geographic domain, whose trends over time represent or draw attention to underlying trends in the condition of the environment.*

1	2	3	4
Doesn't meet the definition	Only partly meets the definition	Largely meets the definition	Fully meets the definition

Please explain:

Bartell: (2) Some uncertainty concerning the meaning of the data given shifts in satellite orbit; chances of satellite failure also. Chlorophyll is only a correlate of productivity and not an actual measure of gross primary productivity.

Gregory: (2)

Hepner: (1) Trends in the indicator are not understandable or traceable to changes in the condition of the environment.

Kapustka: (3) Except that there are problems of capturing variability (see 1 above in terms of 40% annual fluctuation).

4) To what extent do you think the indicator meets each of the following indicator criteria:

a) The indicator makes an important contribution to answering a question for the ROE. (In this context, "important" means that the indicator answers a substantial portion of and/or a critical part of the question.)

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (2)
Gregory: (2)
Hepner: (1)
Kapustka: (3) Except as noted above.

b) The indicator is objective. It is developed and presented in an accurate, clear, complete, and unbiased manner.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (3)
Gregory: (2)
Hepner: (3)
Kapustka: (3)

c) The underlying data are characterized by sound collection methodologies, data management systems that protect its integrity, and quality assurance procedures.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (2)
Gregory: (2)
Hepner: (3)
Kapustka: (2) The main concern is that the data are pre-processed with little or no access to the original data to develop an independent judgment of QA. This is contrary to the basic premises of science.

d) Data are available to describe changes or trends, and the latest available data are timely.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (3)
Gregory: (2)
Hepner: (3)
Kapustka: (3)

e) The data are comparable across time and space, and representative[6] of the target population. Trends depicted in this indicator accurately represent the underlying trends in the target population.

[6] An indicator seeks to describe trends in an overall target "population" (e.g., land area, type of surface water, type of emissions, U.S. population), yet data often can only be sampled from a subset of this population. The validity of

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (2)
Gregory: (2)
Hepner: (1)
Kapustka: (1) The shift in satellite position and the unexplained annual variation cast serious doubt on the validity of any trends that might be reported. These trends must be correlated with other independent measures of plant growth/yield/productivity to have use as a general indicator.

f) The indicator is transparent and reproducible. The specific data used and the specific assumptions, analytic methods, and statistical procedures employed are clearly stated.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (2)
Gregory: (2)
Hepner: (3)
Kapustka: (1) Undocumented pre-processing of data violates this criterion.

Please explain:

Bartell: [no answer provided]

Gregory: [no answer provided]

Hepner: [no answer provided]

Kapustka: [see above]

5) Do you have any suggestions for more effective graphic presentation of the data? If yes, please describe.

Bartell: [no answer provided]

Gregory: [no answer provided]

Hepner: [no answer provided]

Kapustka: Establish ground-truthing measures to verify remotely sensed estimates.

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the trends described by the indicator will depend on the degree to which the sampled population is representative of the target population.

6) Please provide any additional comments, suggestions, or concerns regarding the indicator that you have not already noted in Questions 1 through 5. In particular, note any limitations to the indicator that you have not already described in your responses to the preceding questions.

Bartell: [no answer provided]

Gregory: [no answer provided]

Hepner: Conceptually this should be a good measure of chlorophyll and related processes such as biomass production and carbon dioxide uptake. The use of band ratioing into the NDVI has a long record of effective use of satellite data linked to the biological production and carbon processing across diverse terrain and land covers.

However, features of the indicator graphic, such as the extreme high in 1993 for grassland and the lower index for all covers in 1995- 2000, then a sharp rise in 2001 and decline in 2002 do not show trends that are useful as an indicator of any of the ecological conditions in the ROE.

Kapustka: There was not discussion of problems of remotely sensed data in mountainous terrain – have the protocols for analyses adequately accounted for spatial variability of images resulting changes of slope, aspect?

7) Overall, this indicator:

Bartell: ___X__ Should *not* be included in ROE06 TD.

Gregory: _ **XXX**_ Should *not* be included in ROE06 TD.

Hepner: ___**X**__ Should *not* be included in ROE06 TD

Kapustka: __X__ Should be included in ROE06 TD with the modifications identified above.

Attachment 2: Comment Sheet for Group 1 Indicators

Topic Area: **Ecological Condition**
Indicator Name: **Bird Populations**

1) Please indicate the extent to which you think the proposed indicator is appropriate, adequate, and useful (AA&U) for evaluating ecological conditions and therefore useful for contributing to an overall picture of ecological conditions.

1	2	3	4
Indicator is not AA&U	Indicator is of somewhat AA&U	Indicator is largely AA&U	Indicator is completely AA&U

Bartell: (2) The semi-quantitative nature of the BBS data combined with the lack of consistent trends aggregated at regional and national scales limits the utility of this indicator of bird populations. It is assumed that changes in relative abundance are proportional to fluctuations in actual abundance. The results are highly variable with few consistent patterns.

Gregory: (3) The BBS is a well-established and thoroughly studied monitoring approach. The ability to aggregate the data by habitat type (and possibly other categories in the future. Bird responses can represent local and regional or global pressures. The indicator will not allow explicit analysis of cause and effect would would be invaluable in directing such studies.

Hepner: (2) Discussion and graphic do not match. Discussion (What the data show) numbers are not shown properly as graphic labels of urban and wetland are reversed.

Indicator is difficult to interpret and does not seem adequate to make conclusions about either bird populations or habitat changes.

Kapustka: (3) This indicator uses the wealth of data assembled by the volunteer observers of the Breeding Bird Survey. The information is compiled and has a substantial level of analysis performed by a select group of bird specialists, particularly in terms of spotting suspect entries. The experts have acknowledged several limitations of the survey data including a built in bias for roadside areas, daytime observations, and the favoring of abundant showy species. They have also compiled trend abundance and distribution that includes depictions of ranges displayed as frequency data (an endpoint not described in the summary write-up).

2) Please indicate the extent to which you think the proposed indicator makes an important contribution to answering the specific ROE question it is intended to answer (see Attachment 1 for list of questions). (Note: An indicator may be judged less important if it makes a smaller or less critical contribution to answering the question posed than the other indicators, or if it covers an area of less or diminishing importance environmentally.)

1	2	3	4
Indicator is not important	Indicator is of minor importance	Indicator is important	Indicator is critical

Bartell: (2) Samples are biased, do not capture rare species with any statistical power, and miss many species that are not readily observed from roads (e.g., wetland, alpine species).

Gregory: (4) Indicator addresses an important component of ecosystems and a biotic component that has shown sensitivity to landscape change and environmental contamination.

Hepner: (2)

Kapustka: (3) The indicator has the potential to be a highly useful tracking endpoint despite the limitations noted above. Analyses by Best and by Price have gone deeper into the data than is proposed in this write-up that would be useful to explore.

3) To what extent do you think the indicator meets the following indicator definition:

An "indicator" is ***a numerical value derived from actual measurements of a pressure, ambient condition, exposure, or human health or ecological condition*** *over a specified geographic domain, whose trends over time represent or draw attention to underlying trends in the condition of the environment.*

1	2	3	4
Doesn't meet the definition	Only partly meets the definition	Largely meets the definition	Fully meets the definition

Please explain:

Bartell: (2)

Gregory: (4)

Hepner: (2/3)

Kapustka: (3) This is easily the most data intensive of all the indicators in terms of direct observations. It is also largely balanced geographically, except that data clusters tend to track human population and road density.

4) To what extent do you think the indicator meets each of the following indicator criteria:

a) The indicator makes an important contribution to answering a question for the ROE. (In this context, "important" means that the indicator answers a substantial portion of and/or a critical part of the question.)

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (2)
Gregory: (4)
Hepner: (2)
Kapustka: (3)

b) The indicator is objective. It is developed and presented in an accurate, clear, complete, and unbiased manner.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (2)
Gregory: (3)
Hepner: (2)
Kapustka: (3)

c) The underlying data are characterized by sound collection methodologies, data management systems that protect its integrity, and quality assurance procedures.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (2)
Gregory: (3)
Hepner: (3)
Kapustka: (4)

d) Data are available to describe changes or trends, and the latest available data are timely.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (2)
Gregory: (4)
Hepner: (2)
Kapustka: (4)

e) The data are comparable across time and space, and representative[7] of the target population. Trends depicted in this indicator accurately represent the underlying trends in the target population.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (2)
Gregory: (3)
Hepner: (2)
Kapustka: (4)

f) The indicator is transparent and reproducible. The specific data used and the specific assumptions, analytic methods, and statistical procedures employed are clearly stated.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (2)
Gregory: (3)
Hepner: (2)
Kapustka: (3)

Please explain:

Bartell: The nature of the survey, perhaps despite efforts to train participants, invites inconsistency and large uncertainties in trying to characterize populations that seem to naturally undergo large fluctuations, independent of anthropogenic stresses.

Gregory: [no answer provided]

Hepner: [no answer provided]

Kapustka: In a strict sense, the data are not reproducible, but the huge number of observations tend to swamp many potential errors.

5) Do you have any suggestions for more effective graphic presentation of the data? If yes, please describe.

Bartell: [no answer provided]

[7] An indicator seeks to describe trends in an overall target "population" (e.g., land area, type of surface water, type of emissions, U.S. population), yet data often can only be sampled from a subset of this population. The validity of the trends described by the indicator will depend on the degree to which the sampled population is representative of the target population.

Gregory: [no answer provided]

Hepner: [no answer provided]

Kapustka: The trend data can also be displayed by individual species distribution maps that highlight spatial changes in frequency over time.

6) Please provide any additional comments, suggestions, or concerns regarding the indicator that you have not already noted in Questions 1 through 5. In particular, note any limitations to the indicator that you have not already described in your responses to the preceding questions.

Bartell: Significant increases appear to nearly balance decreases in number of species within each habitat type (Figure 340-1). Not convinced that the BBS is a sensitive measure of trends in bird species diversity.

Yet, despite the limitations, there should be some indicator of bird diversity and abundance as part of the ROE. Thus, with some reservation this indicator should be included, unless another metric for bird diversity can be derived and implemented.

Gregory: [no answer provided]

Hepner: The "What the Data Show" discusses number of particular species by habitat type and exact percentage changes. Why does graphic not do the same? As state earlier graphic is mislabeled based on this discussion.
Graphic shows numbers of species with population changes by habitat. Have many grassland and shrubland individuals of particular species been eliminated or just moved to the city?

Kapustka: The is considerable room for more in-depth analyses that takes into account the life-history characteristics of species or guilds. The indicator as presented, in a fashion similar to those taken from Heinz Foundation studies, does not appear to have any value-added component, but rather seems to extract pieces of information from the existing reports.

7) Overall, this indicator:

Bartell: ___X__ Should be included in ROE06 TD.

Gregory: _**XXX**_ Should be included in ROE06 TD.

Hepner: [no answer provided]

Kapustka: __X___ Should be included in ROE06 TD.

Attachment 2: Comment Sheet for Group 1 Indicators

Topic Area: **Ecological Condition**
Indicator Name: **Fish Faunal Intactness**

1) Please indicate the extent to which you think the proposed indicator is appropriate, adequate, and useful (AA&U) for evaluating ecological conditions and therefore useful for contributing to an overall picture of ecological conditions.

1	2	3	4
Indicator is not AA&U	Indicator is of somewhat AA&U	Indicator is largely AA&U	Indicator is completely AA&U

Bartell: (3) The underlying data and analyses present a nation-scale assessment of the relative loss fish species. The 1997-2003 data set provides a useful baseline for future analyses of regional trends in reductions in fish diversity.

Gregory: (3) HUCs are generally appropriate. The reference to historical richness is not clearly stated and represents a major challenge. The bias for regions with differing inherent richness is a major limitation of the approach. Extinction is an extreme response. This indicator is not sensitive to severe declines in populations.

Hepner: (4) This indicator provides a consistent measure of biological balance ecological conditions on a national level. It will be understandable and, therefore, useful to the ROE

Kapustka: (3) This indicator seems to stem from a belief that there is a balance of nature, a theocratic-based concept—a bias that can easily be deleted from the write-up. The term intactness is not defined operationally, but appears to be generated by backing off of the resolution of coverage from the 8-digit to the 6-digithydrologic cataloging unit. The logic presented is that this helps to reduce errors of omission, presumable by not missing the smaller watersheds. A thorough discussion is needed to explore if this is indeed the case, or if it has the effect of missing important early indicators of range-contraction of some species.

2) Please indicate the extent to which you think the proposed indicator makes an important contribution to answering the specific ROE question it is intended to answer (see Attachment 1 for list of questions). (Note: An indicator may be judged less important if it makes a smaller or less critical contribution to answering the question posed than the other indicators, or if it covers an area of less or diminishing importance environmentally.)

1	2	3	4
Indicator is not important	Indicator is of minor importance	Indicator is important	Indicator is critical

Bartell: (3) The intactness index seems to provide a useful description of the relative changes in fish species diversity throughout the Nation's watersheds.

Gregory: (2)

Hepner: (3) Native fishes are representative of baseline hydrological conditions. The change represents change in the HUC.

Kapustka: (3) If the question posed above is addressed satisfactorily, this could be elevated to a 4.

3) To what extent do you think the indicator meets the following <u>indicator definition</u>:

*An "indicator" is **a numerical value derived from actual measurements of a pressure, ambient condition, exposure, or human health or ecological condition** over a specified geographic domain, whose trends over time represent or draw attention to underlying trends in the condition of the environment.*

1	2	3	4
Doesn't meet the definition	Only partly meets the definition	Largely meets the definition	Fully meets the definition

Please explain:

Bartell: (3) The background material describes the limitations in the underlying data set collected by NatureServe. The index is numerical and derived from actual fish faunal records, studies, technical literature, etc.

Gregory: (2)

Hepner: (4)

Kapustka: (3) Same as previous question.

4) To what extent do you think the indicator meets each of the following <u>indicator criteria</u>:

a) The indicator makes an important contribution to answering a question for the ROE. (In this context, "important" means that the indicator answers a substantial portion of and/or a critical part of the question.)

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (2)
Gregory: (2)
Hepner: (3)
Kapustka: (3)

b) The indicator is objective. It is developed and presented in an accurate, clear, complete, and unbiased manner.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (2)
Gregory: (2)
Hepner: (3)
Kapustka: (3) Largely true, but there are biases regarding the decisions as to which streams are to be sampled that are not explored sufficiently. Also, there is mention of reliance on species-area curve models, but not described in sufficient detail to know what exactly this means.

c) The underlying data are characterized by sound collection methodologies, data management systems that protect its integrity, and quality assurance procedures.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (2)
Gregory: (2)
Hepner: (3)
Kapustka: (3) Sampling designs and in-field sampling criteria are not described adequately.

d) Data are available to describe changes or trends, and the latest available data are timely.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (2)
Gregory: (2)
Hepner: (3)
Kapustka: (3)

e) The data are comparable across time and space, and representative[8] of the target population. Trends depicted in this indicator accurately represent the underlying trends in the target population.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

[8] An indicator seeks to describe trends in an overall target "population" (e.g., land area, type of surface water, type of emissions, U.S. population), yet data often can only be sampled from a subset of this population. The validity of the trends described by the indicator will depend on the degree to which the sampled population is representative of the target population.

Bartell: (2)
Gregory: (2)
Hepner: (3)
Kapustka: (3) The data and analyses seem to do so, however, much discussion is needed regarding the active introduction of non-native species by various State Fish and Game Departments.

f) The indicator is transparent and reproducible. The specific data used and the specific assumptions, analytic methods, and statistical procedures employed are clearly stated.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (2)
Gregory: (2)
Hepner: (3)
Kapustka: (3)

Please explain:

Bartell: The diversity of data sources, dynamic nature of the data, need for additional peer review, as well as QA/QC procedures suggest that the results must be interpreted with some caution. The historical records which serve as the denominator in index are less complete than current records. Thus, there is some unknown degree of uncertainty associated with the index that is not capture in the presentation (i.e., Figure 128-1).

Gregory: [no answer provided]

Hepner: [no answer provided]

Kapustka: As with other data sets, the base data are not reproducible; the more important aspect is whether the analyses are reproducible. There are hints of some conceptual model being used, but this was not explained – there could be hidden biases that would not be obvious to someone launching the analyses anew. Perhaps most critical, there are hints that the baseline for comparison might be 1970, but no basis for this is presented. What prior data were available and how were they determined to serve as the baseline. If not 1970, then what was the baseline?

5) Do you have any suggestions for more effective graphic presentation of the data? If yes, please describe.

Bartell: A table that provided state-by-state summaries of intactness, plus the actual number of historical and current species would help display regional differences in the absolute number of fish species.

Gregory: [no answer provided]

Hepner: [no answer provided]

Kapustka: The only graphic presented is the "reduction of native species." It would be useful to track increases of non-native species as well.

6) Please provide any additional comments, suggestions, or concerns regarding the indicator that you have not already noted in Questions 1 through 5. In particular, note any limitations to the indicator that you have not already described in your responses to the preceding questions.

Bartell: [no answer provided]

Gregory: [no answer provided]

Hepner: Perhaps there is a way to indicate that the Southwestern HUCs have fewer species so tend to have a larger percentage for a given number of species in decline. Another map with absolute numbers of species in decline might be informative.

Kapustka: This analysis begs for correlations of trends with such features as channelization, alteration of headwaters, constriction of riparian zones, and many other landuse activities adjacent to streams.

7) Overall, this indicator:

Bartell: ___X__ Should be included in ROE06 TD.

Gregory: _ **XXX**_ Should be included in ROE06 TD with the modifications identified above.

Hepner: ____**X**_ Should be included in ROE06 TD.

Kapustka: __X__ Should be included in ROE06 TD with the modifications identified above.

Attachment 2: Comment Sheet for Group 1 Indicators

Topic Area: **Ecological Condition**
Indicator Name: **Threatened and Endangered Species**

1) Please indicate the extent to which you think the proposed indicator is appropriate, adequate, and useful (AA&U) for evaluating ecological conditions and therefore useful for contributing to an overall picture of ecological conditions.

1	2	3	4
Indicator is not AA&U	Indicator is of somewhat AA&U	Indicator is largely AA&U	Indicator is completely AA&U

Bartell: (1) As indicated in the background description, the selection of species for listing as threatened or endangered is not necessarily based on sound science.

Gregory: (2)

Hepner: (3) This indicator is appropriate and useful, but not adequate for a broad based measure of trends in diversity and biological balance.

Administrative, legal and political effects on the listing make it difficult to sort out the adequacy of the indicator, and, whether the trends, especially in the 1999-2002 period are a true reflection of trends in diversity.

Kapustka: (2) This proposed indicator appears to be a mere compilation of new federal listings per year.

2) Please indicate the extent to which you think the proposed indicator makes an important contribution to answering the specific ROE question it is intended to answer (see Attachment 1 for list of questions). (Note: An indicator may be judged less important if it makes a smaller or less critical contribution to answering the question posed than the other indicators, or if it covers an area of less or diminishing importance environmentally.)

1	2	3	4
Indicator is not important	Indicator is of minor importance	Indicator is important	Indicator is critical

Bartell: (2) As in 1 above, species listing as T&E does not necessarily derive from objective means. Thus it is difficult to interpret the meaning of the “trend” suggested in the included figure.

Gregory: (3)

Hepner: (3)

Kapustka: (2) My relatively low scoring on this question pertains to the simplicity of the administrative compilation without comment. It would seem that the information says as much about the capacity of the departments to complete administrative steps as it does about the status of any species.

3) To what extent do you think the indicator meets the following indicator definition:

*An "indicator" is **a numerical value derived from actual measurements of a pressure, ambient condition, exposure, or human health or ecological condition** over a specified geographic domain, whose trends over time represent or draw attention to underlying trends in the condition of the environment.*

1	2	3	4
Doesn't meet the definition	Only partly meets the definition	Largely meets the definition	Fully meets the definition

Please explain:

Bartell: (1) T&E status does not reflect an actual measure regarding the ecological condition of the species.

Gregory: (3)

Hepner: (2) Listing is an administrative process, not a more objective measurement of an ecological condition. Consistency over the years is an issue as well.

Kapustka: (1) It is a compilation that potentially has several steps separating the ecological information from the indicator.

4) To what extent do you think the indicator meets each of the following indicator criteria:

a) The indicator makes an important contribution to answering a question for the ROE. (In this context, "important" means that the indicator answers a substantial portion of and/or a critical part of the question.)

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (2)
Gregory: (3)
Hepner: (3)
Kapustka: (2)

b) The indicator is objective. It is developed and presented in an accurate, clear, complete, and unbiased manner.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (1)
Gregory: (2)
Hepner: (2)
Kapustka: (2) There are considerable political biases as to which taxa are pursued for listing.

c) The underlying data are characterized by sound collection methodologies, data management systems that protect its integrity, and quality assurance procedures.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (1)
Gregory: (2)
Hepner: (1)
Kapustka: (2)

d) Data are available to describe changes or trends, and the latest available data are timely.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (1)
Gregory: (2)
Hepner: (2)
Kapustka: (3) Why terminate the plot with 2002 data? Surely the information from 2003 is available, and 2004 should be accessible as well, even if a final compilation is subject to minor adjustments.

e) The data are comparable across time and space, and representative[9] of the target population. Trends depicted in this indicator accurately represent the underlying trends in the target population.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

[9] An indicator seeks to describe trends in an overall target "population" (e.g., land area, type of surface water, type of emissions, U.S. population), yet data often can only be sampled from a subset of this population. The validity of the trends described by the indicator will depend on the degree to which the sampled population is representative of the target population.

Bartell: (1)
Gregory: (1)
Hepner: (2)
Kapustka: (2) Though it would be possible to do so, there is no spatial component presented in this proposed indicator.

f) The indicator is transparent and reproducible. The specific data used and the specific assumptions, analytic methods, and statistical procedures employed are clearly stated.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (1)
Gregory: (2)
Hepner: (1)
Kapustka: (1) The number of listings is what it is; there is no means of altering historical facts.

Please explain:

Bartell: [no answer provided]

Gregory: This indicator reflects BOTH severe declines in species and political process of listing. Many of these species have been threatened or endangered far longer than the last 40 years. The increase depicted in the graph reflect the listing process MORE than the increase in species at risk.

Hepner: [no answer provided]

Kapustka: [see above]

5) Do you have any suggestions for more effective graphic presentation of the data? If yes, please describe.

Bartell: [no answer provided]

Gregory: The different types of biota (plants, mammals, birds, fish, mollusks, other invertebrates) could be listed as stacked bar graph.

Hepner: [no answer provided]

Kapustka: The graphs should be stacked bars with the component parts being taxonomic groupings (e.g. flowering plants, fish, birds…)

6) Please provide any additional comments, suggestions, or concerns regarding the indicator that you have not already noted in Questions 1 through 5. In particular, note any limitations to the indicator that you have not already described in your responses to the preceding questions.

Bartell: [no answer provided]

Gregory: [no answer provided]

Hepner: In spite of my reservations about the process for listing, I believe that indicator should be used.

Kapustka: The proposed indicator is very likely to suggest false interpretations. At the outset, as the administrative structure was being established, the number of listings low ball the actual situation; as the program matures, the tailing of the trend becomes a cap of administrative capacity. Neither have much to do with actual conditions. Move this indicator into the administrative pool not reviewed by this panel.

7) Overall, this indicator:

Bartell: ___X__ Should *not* be included in ROE06 TD.

Gregory: _XXX_ Should be included in ROE06 TD with the modifications identified above.

Hepner: ___ **X** __ Should be included in ROE06 TD.

Kapustka: _X___ Should *not* be included in ROE06 TD.

Attachment 2: Comment Sheet for Group 1 Indicators

Topic Area: **Ecological Condition**
Indicator Name: **Non-Indigenous Species in the Estuaries of Oregon and Washington**

1) Please indicate the extent to which you think the proposed indicator is appropriate, adequate, and useful (AA&U) for evaluating ecological conditions and therefore useful for contributing to an overall picture of ecological conditions.

1	2	3	4
Indicator is not AA&U	Indicator is of somewhat AA&U	Indicator is largely AA&U	Indicator is completely AA&U

Bartell: (2)

Gregory: (2) These indicators are limited regionally to Washington and Oregon. As with other indicators, the reference condition is difficult to define. "Native species" could include alien species that entered the estuaries long before museum collections could have documented their arrival. Given the long history of exploration, this could have been a substantial process.

Hepner: (1) Indicator too limited. Limited to soft bottom communities in 30 estuaries in OR and WA. Limited and inconsistent point sampling (grabs) from which to make inferences about estuarine areas. Only considers species obtainable in grab sampling.

Kapustka: (2) This is a narrowly constructed indicator that does not reflect the title; it should be "relative abundance of non-indigenous benthic species …" The description of the indicator is sketchy in detail and appears to be a work in progress that contains arguments that are not fully formulated [e.g., the discussion about Willapa Bay hard sediment and sediments of Washington and Oregon (limitations section)].

2) Please indicate the extent to which you think the proposed indicator makes an important contribution to answering the specific ROE question it is intended to answer (see Attachment 1 for list of questions). (Note: An indicator may be judged less important if it makes a smaller or less critical contribution to answering the question posed than the other indicators, or if it covers an area of less or diminishing importance environmentally.)

1	2	3	4
Indicator is not important	Indicator is of minor importance	Indicator is important	Indicator is critical

Bartell: (2)

Gregory: (2)

Hepner: (3) Invasive species in important to trends in species diversity and biological balance, but this particular proposed indicator is not ready to be utilized in the ROE.

Kapustka: (2) Way to narrowly constructed geographically.

3) To what extent do you think the indicator meets the following indicator definition:

An "indicator" is ***a numerical value derived from actual measurements of a pressure, ambient condition, exposure, or human health or ecological condition*** *over a specified geographic domain, whose trends over time represent or draw attention to underlying trends in the condition of the environment.*

1	2	3	4
Doesn't meet the definition	Only partly meets the definition	Largely meets the definition	Fully meets the definition

Please explain:

Bartell: (3)

Gregory: (2)

Hepner: (2)

Kapustka: (2) Sampling error in benthic environments have huge error terms; unless adequately accounted for it is impossible to know if the "trends" have validity.

4) To what extent do you think the indicator meets each of the following indicator criteria:

a) The indicator makes an important contribution to answering a question for the ROE. (In this context, "important" means that the indicator answers a substantial portion of and/or a critical part of the question.)

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (2)
Gregory: (2)
Hepner: (2)
Kapustka: (2) To restricted geographically and largely untested at this point.

b) The indicator is objective. It is developed and presented in an accurate, clear, complete, and unbiased manner.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (3)
Gregory: (2)
Hepner: (2)
Kapustka: (3) Potentially so, however, sampling design (location, timing, number of replicates, ...) if not carefully constructed can render this as minimal to no usefulness. The disparity in Fig. 249-2 in the >50% column may signal this problem.

c) The underlying data are characterized by sound collection methodologies, data management systems that protect its integrity, and quality assurance procedures.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (3)
Gregory: (2)
Hepner: (3)
Kapustka: (2) See response to c.

d) Data are available to describe changes or trends, and the latest available data are timely.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (2)
Gregory: (2)
Hepner: (1)
Kapustka: (2) Trend data are not available.

e) The data are comparable across time and space, and representative[10] of the target population. Trends depicted in this indicator accurately represent the underlying trends in the target population.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (2)
Gregory: (2)

[10] An indicator seeks to describe trends in an overall target "population" (e.g., land area, type of surface water, type of emissions, U.S. population), yet data often can only be sampled from a subset of this population. The validity of the trends described by the indicator will depend on the degree to which the sampled population is representative of the target population.

Hepner: (1)
Kapustka: (1) No such comparisons are presented at this time.

f) The indicator is transparent and reproducible. The specific data used and the specific assumptions, analytic methods, and statistical procedures employed are clearly stated.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (3)
Gregory: (3)
Hepner: (2)
Kapustka: (2) Uncertainties have not been addressed.

Please explain:

Bartell: The collection of the benthic grab samples as part of the EMAP suggests that the data result from sound methodology. The samples do not capture non-benthic NIS. The percentages do not characterize the actual numbers of NIS compared to native species.

Gregory: [no answer provided]

Hepner: [no answer provided]

Kapustka: [see above]

5) Do you have any suggestions for more effective graphic presentation of the data? If yes, please describe.

Bartell: [no answer provided]

Gregory: [no answer provided]

Hepner: [no answer provided]

Kapustka: Add time and space trends if data exist; alternatively don't discuss trends.

6) Please provide any additional comments, suggestions, or concerns regarding the indicator that you have not already noted in Questions 1 through 5. In particular, note any limitations to the indicator that you have not already described in your responses to the preceding questions.

Bartell: [no answer provided]

Gregory: [no answer provided]

Hepner: [no answer provided]

Kapustka: Finish the research to determine the utility of this indicator

7) Overall, this indicator:

Bartell: __X__ Should be included in ROE06 TD.

Gregory: _XXX_ Should be included in ROE06 TD with the modifications identified above.

Hepner: __**X**___ Should *not* be included in ROE06 TD

Kapustka: _X___ Should *not* be included in ROE06 TD.

Attachment 2: Comment Sheet for Group 1 Indicators

Topic Area: **Ecological Condition**
Indicator Name: **Forest Disturbance**

1) Please indicate the extent to which you think the proposed indicator is appropriate, adequate, and useful (AA&U) for evaluating ecological conditions and therefore useful for contributing to an overall picture of ecological conditions.

1	2	3	4
Indicator is not AA&U	Indicator is of somewhat AA&U	Indicator is largely AA&U	Indicator is completely AA&U

Bartell: (2) As described in the background information, this indicator is limited in terms of the quality (e.g., number of insect pests, prescribed vs natural burns) and timeliness of the underlying data sets.

Gregory: (None) This indicator combines several forms of disturbance, which can be interrelated. The most serious deficiency of this indicator is the interpretation of the meaning or consequence of this indicator. The indicator does not distinguish severity. But most importantly, it does not recognize and emphasize the important ecological role of these disturgbances. Numerous studies have demonstrated that the reduction or elimination of these forms is disturbance ileads to serious ecological degradation.

Hepner: (2) If this indicator reflects disturbance of all forested lands, then it may be appropriate and adequate. It is not clear that indicator accounts for trends in disturbance for non-governmental forested lands, which are abundant in the eastern and southeastern U S.

Kapustka: (2) Forest disturbance here is limited to fire, insects, and disease. Why ignore the elephant in the room – timber harvest? Also, by lumping all forests together, the distinct differences that exist across regions (i.e., NE vs. SE vs. PNW and other areas) are masked.

2) Please indicate the extent to which you think the proposed indicator makes an important contribution to answering the specific ROE question it is intended to answer (see Attachment 1 for list of questions). (Note: An indicator may be judged less important if it makes a smaller or less critical contribution to answering the question posed than the other indicators, or if it covers an area of less or diminishing importance environmentally.)

1	2	3	4
Indicator is not important	Indicator is of minor importance	Indicator is important	Indicator is critical

Bartell: (2) Difficult to determine the meaning of the trends summarized in Figure 113-1.

Gregory: (3)

Hepner: (3) In general, the trends for disease, insects and fire in the forest are important ecological processes related to the nation's ecosystems. This attempt is not a suitable indicator of these trends.

Kapustka: (2) Too much lost in the synthesis and the parts apparently eliminated from consideration.

3) To what extent do you think the indicator meets the following indicator definition:

*An "indicator" is **a numerical value derived from actual measurements of a pressure, ambient condition, exposure, or human health or ecological condition** over a specified geographic domain, whose trends over time represent or draw attention to underlying trends in the condition of the environment.*

1	2	3	4
Doesn't meet the definition	Only partly meets the definition	Largely meets the definition	Fully meets the definition

Please explain:

Bartell: (2)

Gregory: (2)

Hepner: (2) These data have too many unknowns to determine if it represents trends in the condition of the environment: prescribed vs natural vs human accidental burns, completeness of the data set and limitations of disease data.

Kapustka: (3) Much could be done with this, but the analyses hide the geographical trends.

4) To what extent do you think the indicator meets each of the following indicator criteria:

a) The indicator makes an important contribution to answering a question for the ROE. (In this context, "important" means that the indicator answers a substantial portion of and/or a critical part of the question.)

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (2)
Gregory: (2)
Hepner: (1)

Kapustka: (2) By ignoring harvesting, and other elimination of forest lands (such as for urban expansion), the true picture is lost.

b) The indicator is objective. It is developed and presented in an accurate, clear, complete, and unbiased manner.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (2)
Gregory: (1)
Hepner: (2)
Kapustka: (2) See answer under a.

c) The underlying data are characterized by sound collection methodologies, data management systems that protect its integrity, and quality assurance procedures.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (2)
Gregory: (1)
Hepner: (1)
Kapustka: (2) Responses such as that for T1Q2, T1Q3, and T2Q1 call into question the methods and QA.

d) Data are available to describe changes or trends, and the latest available data are timely.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (2)
Gregory: (3)
Hepner: (2)
Kapustka: (2) Why truncate Figure 113-2 in 1980?

e) The data are comparable across time and space, and representative[11] of the target population. Trends depicted in this indicator accurately represent the underlying trends in the target population.

[11] An indicator seeks to describe trends in an overall target "population" (e.g., land area, type of surface water, type of emissions, U.S. population), yet data often can only be sampled from a subset of this population. The validity of the trends described by the indicator will depend on the degree to which the sampled population is representative of the target population.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (2)
Gregory: (1)
Hepner: (1)
Kapustka: (2) For those components addressed, but not for the condition of forests as a whole.

f) The indicator is transparent and reproducible. The specific data used and the specific assumptions, analytic methods, and statistical procedures employed are clearly stated.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (2)
Gregory: (1)
Hepner: (1)
Kapustka: (2) The Heinz Center report identifies the limited documentation of methods and therefore argues that the studies are not reproducible.

Please explain:

Bartell: [no answer provided]

Gregory: [no answer provided]

Hepner: Data development and origin are not fully explained in either the EPA or Heinz Center data, especially dependency on state reports for disturbance data.

Kapustka: [see above]

5) Do you have any suggestions for more effective graphic presentation of the data? If yes, please describe.

Bartell: Figure 113-1: Use log scale for Y-axis or plot fire on separate plot.

Gregory: [no answer provided]

Hepner: Graphic would be better if amounts of land in forests were provided to give idea of relative amounts of disturbed forest land to total forest land, or provide disturbance acreage as a percentage of total forested land by year.

Kapustka: Put together spatially explicit trend data. How much double counting takes place among the disease, the insect damage, and fire damage? Develop graphics for this.

6) Please provide any additional comments, suggestions, or concerns regarding the indicator that you have not already noted in Questions 1 through 5. In particular, note any limitations to the indicator that you have not already described in your responses to the preceding questions.

Bartell: [no answer provided]

Gregory: [no answer provided]

Hepner: According to the Heinz report, the data show land that subjected to fire is Forest Service shrub and grass land, not strictly forested land?

It is unclear if all forested land, including non-governmental land is included in fire, disease and insect disturbance data.

Kapustka: Much of the context is missing. At a minimum, there should be an inclusion of timber harvest by geographic areas. This should be coupled with depictions of remaining acreages of un-harvested forest. It would also be instructive to document the areas of first-, second-, and third cut. How do these areas align with the other stressor indicators (fire, insect, disease)?

What is the value added by EPA versus that presented in the Heinz Foundation reports?

For this Eco Question 3, why is forest disturbance the only parameter considered? Consider reposing the question.

7) Overall, this indicator:

Bartell: __X___ Should *not* be included in ROE06 TD.

Gregory: __**XXX**___ Should *not* be included in ROE06 TD.

Hepner: ___**X**__ Should *not* be included in ROE06 TD

Kapustka: _X__ Should be included in ROE06 TD with the modifications identified above.

Attachment 2: Comment Sheet for Group 1 Indicators

Topic Area: **Ecological Condition**
Indicator Name: **Changing Streamflows**

1) Please indicate the extent to which you think the proposed indicator is appropriate, adequate, and useful (AA&U) for evaluating ecological conditions and therefore useful for contributing to an overall picture of ecological conditions.

1	2	3	4
Indicator is not AA&U	Indicator is of somewhat AA&U	Indicator is largely AA&U	Indicator is completely AA&U

Bartell: (3)

Gregory: (3) This is a fundamental descriptor of streams and rivers. This is an important measure of ecosystem change in streams. It focuses largely on hydrology and does not provide other measures of biotis change or chemical conditions.

Hepner: (3)

Kapustka: (2) Though the alteration of streams can have profound consequences for valued species and services, the proposed indicator does not appear to have sufficient resolution to capture this critical information. This and other indicators would do well to start with a clear conceptual model that illustrates the linkages of different stressors and different outcomes.

Under the "What the data show" section, lots of percentages are given that on the face suggest false precision. The observation in the second paragraph "there was no discernable trend …" argues that this is not a useful indictor.

2) Please indicate the extent to which you think the proposed indicator makes an important contribution to answering the specific ROE question it is intended to answer (see Attachment 1 for list of questions). (Note: An indicator may be judged less important if it makes a smaller or less critical contribution to answering the question posed than the other indicators, or if it covers an area of less or diminishing importance environmentally.)

1	2	3	4
Indicator is not important	Indicator is of minor importance	Indicator is important	Indicator is critical

Bartell: (3)

Gregory: (3)

Hepner: (3) Stream flows over time is an important indicator of the physical attributes of the nation's ecological systems.

Kapustka: (2) As structured, this is not particularly useful. Indeed, the limitations section argues against this endpoint. Explain the rationale for the combination of increase or decrease as a single measure.

3) To what extent do you think the indicator meets the following indicator definition:

*An "indicator" is **a numerical value derived from actual measurements of a pressure, ambient condition, exposure, or human health or ecological condition** over a specified geographic domain, whose trends over time represent or draw attention to underlying trends in the condition of the environment.*

1	2	3	4
Doesn't meet the definition	Only partly meets the definition	Largely meets the definition	Fully meets the definition

Please explain:

Bartell: (3)

Gregory: (3)

Hepner: (4)

Kapustka: (3) What seems to be missing is the analysis and interpretation of data.

4) To what extent do you think the indicator meets each of the following indicator criteria:

a) The indicator makes an important contribution to answering a question for the ROE. (In this context, "important" means that the indicator answers a substantial portion of and/or a critical part of the question.)

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (3)
Gregory: (3)
Hepner: (3)
Kapustka: (1) The limitations are huge. The analysis revealed no trends.

b) The indicator is objective. It is developed and presented in an accurate, clear, complete, and unbiased manner.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (3)
Gregory: (3)
Hepner: (3)
Kapustka: (3)

c) The underlying data are characterized by sound collection methodologies, data management systems that protect its integrity, and quality assurance procedures.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (3)
Gregory: (3)
Hepner: (3)
Kapustka: (3)

d) Data are available to describe changes or trends, and the latest available data are timely.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (3)
Gregory: (3)
Hepner: (3)
Kapustka: (1) The indictor does not appear to factor in the influence of precipitation or evapotranspiration, which. are critical features affecting flow. Until such normalizations are done, it seems unlikely that alterations of stream corridors could be detected with reliability.

e) The data are comparable across time and space, and representative[12] of the target population. Trends depicted in this indicator accurately represent the underlying trends in the target population.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

[12] An indicator seeks to describe trends in an overall target "population" (e.g., land area, type of surface water, type of emissions, U.S. population), yet data often can only be sampled from a subset of this population. The validity of the trends described by the indicator will depend on the degree to which the sampled population is representative of the target population.

Bartell: (2)
Gregory: (3)
Hepner: (3)
Kapustka: (2) They could be, but without inclusion of the full hydrologic cycle in the conceptual model, this indicator will fail often.

f) The indicator is transparent and reproducible. The specific data used and the specific assumptions, analytic methods, and statistical procedures employed are clearly stated.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (3)
Gregory: (3)
Hepner: (3)
Kapustka: (2) There are limitations on gauging station placements that introduce biases that cannot be overcome easily.

Please explain:

Bartell: [no answer provided]

Gregory: [no answer provided]

Hepner: [no answer provided]

Kapustka: [see above]

5) Do you have any suggestions for more effective graphic presentation of the data? If yes, please describe.

Bartell: [no answer provided]

Gregory: [no answer provided]

Hepner: [no answer provided]

Kapustka: None.

6) Please provide any additional comments, suggestions, or concerns regarding the indicator that you have not already noted in Questions 1 through 5. In particular, note any limitations to the indicator that you have not already described in your responses to the preceding questions.

Bartell: [no answer provided]

Gregory: [no answer provided]

Hepner: The indicator is a good one related to physical attributes. Even though the data is limited a bit since it is all USGS gauge data, at least it has relatively comparable data collection methods and integrity across the nation.

The issues will be in interpretation of the graphics as to whether the base years are the best, the role of climate variation and the role of recent legal and agency decisions to maintain stream flows at specified levels or minimums.

Kapustka: Build the conceptual model and include normalization factors that relate precipitation and evapotranspiration.

7) Overall, this indicator:

Bartell: __X__ Should be included in ROE06 TD.

Gregory: _XXX_ Should be included in ROE06 TD.

Hepner: ____**X**_ Should be included in ROE06 TD.

Kapustka: __X__ Should *not* be included in ROE06 TD.

Attachment 2: Comment Sheet for Group 1 Indicators

Topic Area: **Ecological Condition**
Indicator Name: **Carbon Storage in Forests**

1) Please indicate the extent to which you think the proposed indicator is appropriate, adequate, and useful (AA&U) for evaluating ecological conditions and therefore useful for contributing to an overall picture of ecological conditions.

1	2	3	4
Indicator is not AA&U	Indicator is of somewhat AA&U	Indicator is largely AA&U	Indicator is completely AA&U

Bartell: (2)

Gregory: (3) This is an important measure of forest ecosystem condition. It is limited because it addresses only forest lands and only two-thirds of the forest lands. Nonetheless, it is a useful measure of forest ecosystems.

Hepner: (3) Assessment of the carbon cycling process is an important part of the trends in the physical and chemical attributes of the nation's ecological system. This indicator, albeit limited, has sufficient geographic coverage and time span to be adequate and useful.

Kapustka: (4) This indicator may be the most "mature" of the whole proposed set in that it provides good spatial and temporal analyses of trends.

2) Please indicate the extent to which you think the proposed indicator makes an important contribution to answering the specific ROE question it is intended to answer (see Attachment 1 for list of questions). (Note: An indicator may be judged less important if it makes a smaller or less critical contribution to answering the question posed than the other indicators, or if it covers an area of less or diminishing importance environmentally.)

1	2	3	4
Indicator is not important	Indicator is of minor importance	Indicator is important	Indicator is critical

Bartell: (2)

Gregory: (3)

Hepner: (3) Forests have a major long term role in carbon sequestration in terrestrial ecosystems. If this indicator were more complete (ie. included Alaska and Hawaii, and more complete data on all forested land), I would consider it to be critical.

Kapustka: (4) As a high level ecological process, carbon storage integrates the dynamics of the systems under examination.

3) To what extent do you think the indicator meets the following indicator definition:

An "indicator" is ***a numerical value derived from actual measurements of a pressure, ambient condition, exposure, or human health or ecological condition*** *over a specified geographic domain, whose trends over time represent or draw attention to underlying trends in the condition of the environment.*

1	2	3	4
Doesn't meet the definition	Only partly meets the definition	Largely meets the definition	Fully meets the definition

Please explain:

Bartell: (2) Carbon is estimated from statistical models based on tree trunk size.

Gregory: (3)

Hepner: (3)

Kapustka: (4) Data are collected strategically and then synthesized into regional and national values using established methods that have been scrutinized extensively in academic circles and published in open literature.

4) To what extent do you think the indicator meets each of the following indicator criteria:

a) The indicator makes an important contribution to answering a question for the ROE. (In this context, "important" means that the indicator answers a substantial portion of and/or a critical part of the question.)

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (2)
Gregory: (3)
Hepner: (3)
Kapustka: (4) As a grand synthesizer, this indicator should set the platform upon which many other indicators could be evaluated.

b) The indicator is objective. It is developed and presented in an accurate, clear, complete, and unbiased manner.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (2)
Gregory: (3)
Hepner: (3)
Kapustka: (4) Yes, in the sense that the conceptual model of forest carbon flow is characterized, there is reasonable accuracy. The extent of consensus reached among researchers in this area help remove inherent biases. One obvious bias in this indicator (not a problem for this indicator per se) is that other land cover types beg for similar analyses so that a comprehensive carbon sequestration picture could be developed – not just one for forests.

c) The underlying data are characterized by sound collection methodologies, data management systems that protect its integrity, and quality assurance procedures.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (2)
Gregory: (3)
Hepner: (3)
Kapustka: (4)

d) Data are available to describe changes or trends, and the latest available data are timely.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (3)
Gregory: (3)
Hepner: (3)
Kapustka: (4)

e) The data are comparable across time and space, and representative[13] of the target population. Trends depicted in this indicator accurately represent the underlying trends in the target population.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

[13] An indicator seeks to describe trends in an overall target "population" (e.g., land area, type of surface water, type of emissions, U.S. population), yet data often can only be sampled from a subset of this population. The validity of the trends described by the indicator will depend on the degree to which the sampled population is representative of the target population.

Bartell: (2)
Gregory: (3)
Hepner: (2)
Kapustka: (4) This might deserve a 3, in that structural differences among different forest types might not be fully accounted for.

f) The indicator is transparent and reproducible. The specific data used and the specific assumptions, analytic methods, and statistical procedures employed are clearly stated.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (3)
Gregory: (3)
Hepner: (3)
Kapustka: (4) Overall, this indicator has excellent documentation regarding source data, methods of collection, steps of analyses, and interpretation.

Please explain:

Bartell: [no answer provided]

Gregory: [no answer provided]

Hepner: Changing FIA methods and a lack of uniformity in state reporting make this indicator less reliable over the earlier time periods, but should be increasing useful in the future.

Kapustka: [see above]

5) Do you have any suggestions for more effective graphic presentation of the data? If yes, please describe.

Bartell: [no answer provided]

Gregory: [no answer provided]

Hepner: Timing of improved data availability and effect on interpreting trends should be noted.

Kapustka: No.

6) Please provide any additional comments, suggestions, or concerns regarding the indicator that you have not already noted in Questions 1 through 5. In particular, note any limitations to the indicator that you have not already described in your responses to the preceding questions.

Bartell: [no answer provided]

Gregory: [no answer provided]

Hepner: [no answer provided]

Kapustka: This process should be expanded to include shrublands, wetlands, grasslands, etc.

7) Overall, this indicator:

Bartell: __X__ Should *not* be included in ROE06 TD.

Gregory: _XXX_ Should be included in ROE06 TD.

Hepner: ___ **X** __ Should be included in ROE06 TD.

Kapustka: __X__ Should be included in ROE06 TD.

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Comments for Group 2 Indicators

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Attachment 3: Comment Sheet for Group 2 Indicators

Topic Area: **Ecological Condition**
Indicator Name: **Wetland Extent, Change, and Sources of Change**

1) To what extent do you agree with this statement:

> This indicator is appropriate, adequate, and useful (AA&U) for evaluating ecological conditions and therefore useful for contributing to an overall picture of ecological conditions.

1	2	3	4
Indicator is not AA&U	Indicator is of somewhat AA&U	Indicator is largely AA&U	Indicator is completely AA&U

Bartell: (3)

Gregory: (3) This is a critical ecosystem type in the US and the inverntory methods are well established. There are methodological changes that must be considered in evaluating trends, but it is still a strong indicator.

Hepner: (3)

Kapustka: (4) This proposed indicator provides very useful information despite the limitations listed in the write-up. It has the benefit of long-term characterization and offers the opportunity to assign causality related to observed trends. The indicator is readily amenable to influence environmental management decisions and formulation of policies.

2) To what extent do you agree with this statement:

> This indicator makes an important contribution[14] to answering the specific ROE question it is intended to answer (see Attachment 1 for list of questions).

1	2	3	4
Indicator is not important	Indicator is of minor importance	Indicator is important	Indicator is critical

Bartell: (4) Despite the limitations described in the background materials, there is an urgent need for an indicator of wetland loss to be included in the ROE.

Gregory: (3) While it does not distinguish wetland conditions, the loss of wetlands is so great that this simple measure must be included.

Hepner: (3)

[14] Note: An indicator may be judged less important if it makes a smaller or less critical contribution to answering the question posed than the other indicators, or if it covers an area of less or diminishing importance environmentally.

Kapustka: (4) This provides a readily understandable characterization of landuse that helps chart the consequences of various actions.

3) Please provide any additional comments, suggestions, or concerns regarding the indicator that you may have.

Bartell: [no answer provided]

Gregory: This indicator should be included in the ROE.

Hepner: The trends in wetlands is a foundational aspect of several ecological process. In spite of the limitations on wetland definition, data collection over time and non-inclusion of Alaska and Hawaii, the indicator is informative and useful.

Kapustka: None.

Attachment 3: Comment Sheet for Group 2 Indicators

Topic Area: **Ecological Condition**
Indicator Name: **Coastal Habitat Index**

1. To what extent do you agree with this statement:

   This indicator is appropriate, adequate, and useful (AA&U) for evaluating ecological conditions and therefore useful for contributing to an overall picture of ecological conditions.

1	2	3	4
Indicator is not AA&U	Indicator is of somewhat AA&U	Indicator is largely AA&U	Indicator is completely AA&U

Bartell: (2) The absence of data from Alaska diminish the overall utility of this index.

Gregory: (3) Similar to Wetland Change. Same inventory.

Hepner: (1) Coastal habitat is of critical importance to coastal and estuarine ecosystems. However, this indicator is too limited in the scope of ecological metrics used, has severe limits on coverage (Alaska, Hawaii not included; Great Lakes uses different approach).

Kapustka: (4) Though this is a macro-analysis of shoreline cover types, it provide direct information on the status of wetlands and can be interpreted as a surrogate for various fish and wildlife habitat conditions.

2. To what extent do you agree with this statement:

   This indicator makes an important contribution[15] to answering the specific ROE question it is intended to answer (see Attachment 1 for list of questions).

1	2	3	4
Indicator is not important	Indicator is of minor importance	Indicator is important	Indicator is critical

Bartell: (3) The inclusion of an indicator of wetland condition seems to augment the "wetland extent" indicator. Yet, the wetland extend indicator seems to provide a better characterization of trends, regionally and nationally. The coastal habitat index might be somewhat redundant and less useful. The tabular summary does not convey much information and is somewhat confusing.

Gregory: (3)

Hepner: (3)

[15] Note: An indicator may be judged less important if it makes a smaller or less critical contribution to answering the question posed than the other indicators, or if it covers an area of less or diminishing importance environmentally.

Kapustka: (4) Because of development pressures on the coastal wetlands, this is a very important feature to monitor.

3) Please provide any additional comments, suggestions, or concerns regarding the indicator that you may have.

Bartell: [no answer provided]

Gregory: The graphics for this indicator are overly simplistic and would benefit from graphical representation simlar to that of Wetland Change.

Hepner: Interpretation of actual meaning of the indicator is not easy to non-experts.

Kapustka: Because habitat is a term that demands identification of the target species or guild of interest, it would be better to call this index a coastal wetlands index. Graphical depictions that show where wetlands have been lost or have shifted would be very useful to improve communications regarding the status and trends of this resource.

Attachment 3: Comment Sheet for Group 2 Indicators

Topic Area: **Ecological Condition**
Indicator Name: **Land Cover**

1. To what extent do you agree with this statement:

   This indicator is appropriate, adequate, and useful (AA&U) for evaluating ecological conditions and therefore useful for contributing to an overall picture of ecological conditions.

1	2	3	4
Indicator is not AA&U	Indicator is of somewhat AA&U	Indicator is largely AA&U	Indicator is completely AA&U

Bartell: (2) The limitations in the data, as well as the discrepancies between the NLCD, the FIA, and the NRI assessments suggest that the Land Cover indicator somewhat AA&U for the ROE.

Gregory: (2) The major concerns over this indicator are 1) its extent, 2) its availability in the future for trend analysis, 3) changes in sensors and methodology in the future that may create artifacts, and 4) interpretation of the ecological implications of land cover classes (which may differ strongly in their ecological effects across the United States.

Hepner: (3)

Kapustka: (3) This macro-level depiction of land cover types provides a solid foundation for considering many other proposed indicators. The reason for not scoring this a 4 is that as presented this has only a spatial presentation and not a trend analysis.

2. To what extent do you agree with this statement:

   This indicator makes an important contribution[16] to answering the specific ROE question it is intended to answer (see Attachment 1 for list of questions).

1	2	3	4
Indicator is not important	Indicator is of minor importance	Indicator is important	Indicator is critical

Bartell: (3) The Land Cover indicator will become useful for trend analysis only when subsequent data (ca 2001) have been complied and compared with 1992 conditions.

Gregory: (3)

[16] Note: An indicator may be judged less important if it makes a smaller or less critical contribution to answering the question posed than the other indicators, or if it covers an area of less or diminishing importance environmentally.

Hepner: (4) Land cover is fundamental to understanding the extent and distribution of ecosystems.

Kapustka: (4) Especially if temporal patterns are added.

3) Please provide any additional comments, suggestions, or concerns regarding the indicator that you may have.

Bartell: The map is at sufficiently coarse resolution as to make it difficult to interpret the results other than at more regional scales.

Gregory: [no answer provided]

Hepner: This indicators maps and charts will be more useful once the NLCD2001 is compared to the original NLCD.

Kapustka: Would it be feasible to compare to historical cover patterns much like was done for the wetlands extent? That would greatly enhance the usefulness of this indicator.

Attachment 3: Comment Sheet for Group 2 Indicators

Topic Area: **Ecological Condition**
Indicator Name: **Land Use**

1. To what extent do you agree with this statement:

   This indicator is appropriate, adequate, and useful (AA&U) for evaluating ecological conditions and therefore useful for contributing to an overall picture of ecological conditions.

1	2	3	4
Indicator is not AA&U	Indicator is of somewhat AA&U	Indicator is largely AA&U	Indicator is completely AA&U

Bartell: (3)

Gregory: (2) Limitations are similar to that for Land Cover but even grareter. It is useful but the ecological consequences of land uses differ greatly by region and land use type. The combination of source (NRI, FIA, NASS) introduces enormous uncertainty and sources or error. Reporting in these federal programs is uneven and has been a challenge for application within the agencies, let alone application across agencies and intended uses. The lack of information on urban and residential lands makes it even more limited.

Hepner: (2) Land use patterns are critical the evaluation of trends in ecosystems. This indicator is not sufficiently appropriate and adequate, therefore, not that useful

Kapustka: (3) The greatest limitation in the structure of this indicator stems from the choice of landuse categories. This reflects the missions of the USDA, the primary compilers of these data. From a broader environmental perspective, there would be benefit in adding additional categories such as parks, reserves, greenbelts, and impervious surfaces. The detail tracking by Regions over time is very useful.

2. To what extent do you agree with this statement:

   This indicator makes an important contribution[17] to answering the specific ROE question it is intended to answer (see Attachment 1 for list of questions).

1	2	3	4
Indicator is not important	Indicator is of minor importance	Indicator is important	Indicator is critical

[17] Note: An indicator may be judged less important if it makes a smaller or less critical contribution to answering the question posed than the other indicators, or if it covers an area of less or diminishing importance environmentally.

Bartell: (3) Despite the limitations outlined in the background materials, the Land Use indicator provides useful information for assessing regional and national trends. The ROE needs some indicator of land use changes.

Gregory: (3)

Hepner: (None) There is a great need for a national land use indicator, but not as it is presented here.

Kapustka: (3) Same concerns as noted in 1 above.

3) Please provide any additional comments, suggestions, or concerns regarding the indicator that you may have.

Bartell: [no answer provided]

Gregory: [no answer provided]

Hepner: Land use is necessarily more difficult to compile than land cover, requiring many separate data sources and classification interpretations. I would suggest this system has sufficient classification granularity for non-urban uses, but is totally inadequate for "developed." Also maps of use and use change are needed to show differential geographic impacts of land use change. Some types of change and locations (residential growth in coastal areas) are more important to the more sensitive ecosystem. This indicators lacks this information. Use one of the existing land use classifications, such as the modified Anderson system which lends itself to multiple resolutions and remote sensing data at regional scales.

Kapustka: None.

Attachment 3: Comment Sheet for Group 2 Indicators

Topic Area: **Ecological Condition**
Indicator Name: **Forest Extent and Type**

1. To what extent do you agree with this statement:

   This indicator is appropriate, adequate, and useful (AA&U) for evaluating ecological conditions and therefore useful for contributing to an overall picture of ecological conditions.

1	2	3	4
Indicator is not AA&U	Indicator is of somewhat AA&U	Indicator is largely AA&U	Indicator is completely AA&U

Bartell: (3)

Gregory: (2)

Hepner: (3) Methodology appears sound. Better imagery in recent years should help improve accuracy of classification to offset fewer areas being sampled.

Kapustka: (4) This proposed indicator incorporates a wealth of historical data at macro-scales that have been aggregated by Regions and forest types.

2. To what extent do you agree with this statement:

   This indicator makes an important contribution[18] to answering the specific ROE question it is intended to answer (see Attachment 1 for list of questions).

1	2	3	4
Indicator is not important	Indicator is of minor importance	Indicator is important	Indicator is critical

Bartell: (3)

Gregory: (3) This indicator is a subset of the Land Use indicator. The FIA database has been improved in recent years. It is a useful tracking of general forest conditions. Ecological interpretation of the consequences is questionable. Note the lack of substantial change since 1907, yet forest practices and ecological conditions and streams and forests have changed markedly over that century. How would this indicator reveal significant changes in forest condition in the future?

Hepner: (3)

[18] Note: An indicator may be judged less important if it makes a smaller or less critical contribution to answering the question posed than the other indicators, or if it covers an area of less or diminishing importance environmentally.

Kapustka: (4) The long-term perspective is especially useful in evaluating contemporary trends.

3) Please provide any additional comments, suggestions, or concerns regarding the indicator that you may have.

Bartell: [no answer provided]

Gregory: [no answer provided]

Hepner: I am unclear as to whether EPA Region 10 has Alaska forest and timber lands are included?

Kapustka: It is important that the compilation of these data continue to be moved into GIS platforms, especially if there are ways to add links to field studies that could serve to enhance the ground-truthing and expand the coverage over time.

Attachment 3: Comment Sheet for Group 2 Indicators

Topic Area: **Ecological Condition**
Indicator Name: **Urbanization and Population Change**

1. To what extent do you agree with this statement:

   This indicator is appropriate, adequate, and useful (AA&U) for evaluating ecological conditions and therefore useful for contributing to an overall picture of ecological conditions.

1	2	3	4
Indicator is not AA&U	Indicator is of somewhat AA&U	Indicator is largely AA&U	Indicator is completely AA&U

Bartell: (3)

Gregory: (2) Pop;ulation is a major driver of environmental change. This is an important indicator and the measures are well established.

Hepner: (3)

Kapustka: (4) The components of this indicator have major influences on most if not all of the other potential indicators. Longitudinal studies that are spatially explicit provide a solid basis for predicting future stresses from the expansion of populations in urban areas.

2. To what extent do you agree with this statement:

   This indicator makes an important contribution[19] to answering the specific ROE question it is intended to answer (see Attachment 1 for list of questions).

1	2	3	4
Indicator is not important	Indicator is of minor importance	Indicator is important	Indicator is critical

Bartell: (3) The per capita contribution to environmental degradation has clearly changed through time, thus adding some uncertainty into evaluating trends in population size and developed lands.

Gregory: (3)

Hepner: (3)

[19] Note: An indicator may be judged less important if it makes a smaller or less critical contribution to answering the question posed than the other indicators, or if it covers an area of less or diminishing importance environmentally.

Kapustka: (4) The trends in population growth are critical in characterizing the state of the environment. Indeed, these generally are the most obvious of environmental stressors and the one that is typically avoided in addressing tough environmental management decisions and formulations of environmental policies.

3) Please provide any additional comments, suggestions, or concerns regarding the indicator that you may have.

Bartell: [no answer provided]

Gregory: [no answer provided]

Hepner: I believe that a map of the US showing the EPA regions with data presented for Figure 256.3 and 256.4 would be more informative.

Kapustka: Add animated color graphics to track changes nationally with the capability of zooming in to sub-regional areas.

Attachment 3: Comment Sheet for Group 2 Indicators

Topic Area: **Ecological Condition**
Indicator Name: **Coastal Benthic Index**

1. To what extent do you agree with this statement:

   This indicator is appropriate, adequate, and useful (AA&U) for evaluating ecological conditions and therefore useful for contributing to an overall picture of ecological conditions.

1	2	3	4
Indicator is not AA&U	Indicator is of somewhat AA&U	Indicator is largely AA&U	Indicator is completely AA&U

Bartell: (2)

Gregory: (3) Multimetric indicators can obscure critical patterns. I encourage EPA to consider use of invertebrate modeling approaches (such as RIVPAKS).

Hepner: (4) This indicator provides national coverage of an important index.

Kapustka: (2) The write-up assumes that one knows the formulation of the index and the parsing of categories (low, medium, high). The ambiguity of the description given for calculating the score and for assigning relative values suggests that there is much room for investigator bias to creep into the index.

2. To what extent do you agree with this statement:

   This indicator makes an important contribution[20] to answering the specific ROE question it is intended to answer (see Attachment 1 for list of questions).

1	2	3	4
Indicator is not important	Indicator is of minor importance	Indicator is important	Indicator is critical

Bartell: (2) Limitations in the data (e.g., July-Sep samples) reduce the importance of this index.

Gregory: (3)

Hepner: (3)

[20] Note: An indicator may be judged less important if it makes a smaller or less critical contribution to answering the question posed than the other indicators, or if it covers an area of less or diminishing importance environmentally.

Kapustka: (3) If the concerns mentioned in 1 above are overcome, then this score could rise to 4 as it could become an important surrogate measure for collective stressors on the benthic communities of marine coastal waters.

3) Please provide any additional comments, suggestions, or concerns regarding the indicator that you may have.

Bartell: [no answer provided]

Gregory: [no answer provided]

Hepner: I would like to see a map of the EPA regions with index portrayed. Legend and title of graphic needs to be clearer as to what a low (1) and a high (5) actually mean.

Kapustka: Explain the metrics and the uncertainties as well as potential sources of measurement errors. Provide spatially explicit maps of index values within specific areas (large bays, regional coastal areas).

Attachment 3: Comment Sheet for Group 2 Indicators

Topic Area: **Ecological Condition**
Indicator Name: **Harmful Algal Bloom Outbreaks**

1. To what extent do you agree with this statement:

   This indicator is appropriate, adequate, and useful (AA&U) for evaluating ecological conditions and therefore useful for contributing to an overall picture of ecological conditions.

1	2	3	4
Indicator is not AA&U	Indicator is of somewhat AA&U	Indicator is largely AA&U	Indicator is completely AA&U

Bartell: (2)

Gregory: (2) The period of record is relatively short. In addition, the interpretation of harmful outbreaks is somewhat vague. These events are undesirable, but their link directly to environmental degradation or undesirable change is questionable.

Hepner: (2) I am not sure this is adequate as it informs very little about the biological balance. The patterns shown in the graphics may be fully in balance with historical patterns both temporally and geographically. The data do not really tell me if these outbreaks are indicators of pollution, species change or any other altered ecological condition, other than algae.

Kapustka: (2) Though this is an important phenomenon, the indicator as presented is deficient in that standardized methods are not employed across the Gulf States Region and the spatial distribution of the event is not charted. Moreover, there are analogous algal blooms in other coastal areas – why restrict this indicator solely to the Gulf? EPA and perhaps the CDC should be working with the States toward standardizing the sampling and reporting methods in order to improve the charting of this class of environmental problem.

2. To what extent do you agree with this statement:

   This indicator makes an important contribution[21] to answering the specific ROE question it is intended to answer (see Attachment 1 for list of questions).

1	2	3	4
Indicator is not important	Indicator is of minor importance	Indicator is important	Indicator is critical

[21] Note: An indicator may be judged less important if it makes a smaller or less critical contribution to answering the question posed than the other indicators, or if it covers an area of less or diminishing importance environmentally.

Bartell: (2) The geographical limitation to the Gulf of Mexico diminishes the value of this indicator. The comparatively short-term temporal local spatial dynamics of HABs also reduce the usefulness of this indicator for the ROE.

Gregory: (2)

Hepner: (1)

Kapustka: (2) See answer above.

3) Please provide any additional comments, suggestions, or concerns regarding the indicator that you may have.

Bartell: [no answer provided]

Gregory: [no answer provided]

Hepner: [no answer provided]

Kapustka: See answer above.

Attachment 3: Comment Sheet for Group 2 Indicators

Topic Area: **Ecological Condition**
Indicator Name: **SAV in Chesapeake Bay**

1. To what extent do you agree with this statement:

   This indicator is appropriate, adequate, and useful (AA&U) for evaluating ecological conditions and therefore useful for contributing to an overall picture of ecological conditions.

1	2	3	4
Indicator is not AA&U	Indicator is of somewhat AA&U	Indicator is largely AA&U	Indicator is completely AA&U

Bartell: (2)

Gregory: (2) This measure is extremely limited geographically. Also, the period of record is limited. The causes for the changes in vegetation are a mix of both anthropogenic changes and climatic changes. Distinguishing the relative contributions of different human actions also may be difficult.

Hepner: (1) I do not deem this indicator adequate and useful as involves only Chesapeake Bay. More importantly, the data is sporadic, missing several years and areas of sampling in other years.

Kapustka: (2) Submerged aquatic vegetation is important for a variety of reasons (e.g., spawning, nursery, and feeding areas for aquatic animals; nutrient processing; turbidity/erosion modulation). Each of these ecological services is influenced both by amount of cover and the plant species providing the cover. Though an important set of parameters, this proposed indicator appears to be in the development stage.

2. To what extent do you agree with this statement:

   This indicator makes an important contribution[22] to answering the specific ROE question it is intended to answer (see Attachment 1 for list of questions).

1	2	3	4
Indicator is not important	Indicator is of minor importance	Indicator is important	Indicator is critical

Bartell: (2) Difficult to interpret highly variable and imprecise estimates of SAV obtained from black and white photos. Limited geographical extent.. several important controlling factors not anthropogenic...

[22] Note: An indicator may be judged less important if it makes a smaller or less critical contribution to answering the question posed than the other indicators, or if it covers an area of less or diminishing importance environmentally.

Gregory: (2)

Hepner: (1)

Kapustka: (2) In addition to the limitations on interpretation of findings, the restriction to one bay, albeit an important one, provides limited utility as a national indicator.

3) Please provide any additional comments, suggestions, or concerns regarding the indicator that you may have.

Bartell: [no answer provided]

Gregory: [no answer provided]

Hepner: Figure 317R-1- What does the B&W cross hatch pattern on the bars indicate?

Kapustka: What variability existed in the data used to compile the “baseline” condition of 1930-1950? Understanding annual variability, including post-storm events, is critical to gaining a sense of importance of shifts such as that noted for 2003.

Attachment 3: Comment Sheet for Group 2 Indicators

Topic Area: **Ecological Condition**
Indicator Name: **Chesapeake Bay Blue Crabs: Mature Females - Spawning Stock Abundance**

1. To what extent do you agree with this statement:

   This indicator is appropriate, adequate, and useful (AA&U) for evaluating ecological conditions and therefore useful for contributing to an overall picture of ecological conditions.

1	2	3	4
Indicator is not AA&U	Indicator is of somewhat AA&U	Indicator is largely AA&U	Indicator is completely AA&U

Bartell: (3)

Gregory: (2) Again, this measure is extremely limited geographically and the period of record is limited. The causes for the changes in crab abundance include human harvest as well as environmental change. Interpretation of theswe trends would face the same challenge as any other commercial species abudance trend. Many other species have longer records and have more well-established assessment techniques (e.g., coho salmon, Chinook salmon, Atlantic salmon, sockeye, cod, halibut, and others).

Hepner: (3) It is a regional indicator, but I would think important as a view of both the important Chesapeake Bay area and the Atlantic Coast.

Kapustka: (2) Though the blue crab fishery is important to the economy of the area, the case is not made as to why the bay-specific dataset provide a useful look into national environmental conditions.

2. To what extent do you agree with this statement:

   This indicator makes an important contribution[23] to answering the specific ROE question it is intended to answer (see Attachment 1 for list of questions).

1	2	3	4
Indicator is not important	Indicator is of minor importance	Indicator is important	Indicator is critical

Bartell: (3) It would be useful to have some scale indicating the numbers of spawning females in addition to the normalized index shown in Figure 320R-1.

[23] Note: An indicator may be judged less important if it makes a smaller or less critical contribution to answering the question posed than the other indicators, or if it covers an area of less or diminishing importance environmentally.

Gregory: (2)

Hepner: (3)

Kapustka: (2) This could be an important component of a larger synthesis that aggregated data such as these with other populations of shellfish and finfish. As a restricted dataset, however, it has limited usefulness for the purpose of characterizing the national environmental condition.

3) Please provide any additional comments, suggestions, or concerns regarding the indicator that you may have.

Bartell: [no answer provided]

Gregory: [no answer provided]

Hepner: I support use of this indicator for the reason above, especially if the final ROE indicator will reflect the undated assessment cited in the description.

Kapustka: The data depicted in Figure 230R-1 do not make a compelling case for any trend.

Attachment 3: Comment Sheet for Group 2 Indicators

Topic Area: **Ecological Condition**
Indicator Name: **Pesticide-Resistant Arthropod Species**

1. To what extent do you agree with this statement:

   This indicator is appropriate, adequate, and useful (AA&U) for evaluating ecological conditions and therefore useful for contributing to an overall picture of ecological conditions.

1	2	3	4
Indicator is not AA&U	Indicator is of somewhat AA&U	Indicator is largely AA&U	Indicator is completely AA&U

Bartell: (2) It is unclear what a local record of resistance means in relation to overall resistance at a national scale. Also does not address pest susceptibility and subsequent control by newer pesticides.

Gregory: (1) While development of resistance to pesticides is a concern and has ecological implications, it is more a signal of human interest and analytical capability than ecological degradation. The reference or basleine is difficult to establish, because the analytical capabilities and surveys have changed throughout the period of record. I cannot see how this indicator provides useful information on the state of the environment.

Hepner: (3)

Kapustka: (2) The phenomenon of pesticide resistance poses intriguing problems for production of food and fiber. The analysis presented here tracks the occurrence of documented resistant taxa among arthropods over time (though time is $\pm$ a year or two) from 1950 through 2000. The generalized trend of resistant species rose through the early 1970s (if one uses moving averages) and then declined somewhat through the remainder of the period. The occurrences were correlated with the number of newly registered pesticides. A much better independent variable would be the quantity of pesticides used per year (perhaps with a lagging indicator) rather than the number of active ingredients.

2. To what extent do you agree with this statement:

   This indicator makes an important contribution[24] to answering the specific ROE question it is intended to answer (see Attachment 1 for list of questions).

1	2	3	4
Indicator is not important	Indicator is of minor importance	Indicator is important	Indicator is critical

[24] Note: An indicator may be judged less important if it makes a smaller or less critical contribution to answering the question posed than the other indicators, or if it covers an area of less or diminishing importance environmentally.

Bartell: (2)

Gregory: (1)

Hepner: (3)

Kapustka: (2) In addition to the limitations listed in the write-up, there is no indication of the consequences of these resistant taxa. How have they altered crop production? Pesticide use? Ancillary impacts to non-target receptors?

3) Please provide any additional comments, suggestions, or concerns regarding the indicator that you may have.

Bartell: [no answer provided]

Gregory: [no answer provided]

Hepner: It would be informative to see a data graphic comparable for years 1950-1999 that portrays the cumulative numbers of species resistant over this time.

Figure 225-1 should label vertical axis as “number of species.”

Kapustka: This is an interesting study, but not one that is appropriate for use as an indicator, especially if the study has ended in 2000 as suggested by the termination of the data in Figure 225-1.

Attachment 3: Comment Sheet for Group 2 Indicators

Topic Area: **Ecological Condition**
Indicator Name: **Nitrogen and Phosphorus Discharges from Large Rivers**

1. To what extent do you agree with this statement:

   This indicator is appropriate, adequate, and useful (AA&U) for evaluating ecological conditions and therefore useful for contributing to an overall picture of ecological conditions.

1	2	3	4
Indicator is not AA&U	Indicator is of somewhat AA&U	Indicator is largely AA&U	Indicator is completely AA&U

Bartell: (2)

Gregory: (4) Nitrate and soluble reactive phosphorus are assimilated rapidly by freshwater algae and have been well established as major causes of eutrophication. Nitrate is also one of the most mobile forms of nitrogen. Nitrate and SRP discharge from large rivers is an excellent indicator of environmental conditions. The indicator would be strengthened y application to more rivers, but the four included in the current indicator represent four important regions of the United States.

Hepner: (2) Only covers limited number of rivers for limited nutrients. Not on level of adequacy with other indicators.

Kapustka: (3) This indicator provides insight into the landuse practices of the major rivers as well as provides source input information for possible causal linkages with effects on estuarine and coastal receptors.

2. To what extent do you agree with this statement:

   This indicator makes an important contribution[25] to answering the specific ROE question it is intended to answer (see Attachment 1 for list of questions).

1	2	3	4
Indicator is not important	Indicator is of minor importance	Indicator is important	Indicator is critical

Bartell: (3) As described in the background materials, the four rivers account for about half of the freshwater flow entering the coastal oceans for the lower 48 states. Trends are also influenced by the timing and location of newer sewage treatment technologies...

[25] Note: An indicator may be judged less important if it makes a smaller or less critical contribution to answering the question posed than the other indicators, or if it covers an area of less or diminishing importance environmentally.

Gregory: (4)

Hepner: (1)

Kapustka: (3) The integrating nature of these nutrient discharges can be very useful in focusing potential resources for environmental management. Refinement of the sampling locations could be useful toward identifying sources (e.g., feedlots, agricultural runoff, forest disturbance).

3) Please provide any additional comments, suggestions, or concerns regarding the indicator that you may have.

Bartell: [no answer provided]

Gregory: [no answer provided]

Hepner: [no answer provided]

Kapustka: It might be helpful to normalize discharge loads to precipitation/runoff levels.

Expansion to include other watersheds, especially those that might be expected to have high runoff or high impact potential, should be considered early on.

Attachment 3: Comment Sheet for Group 2 Indicators

Topic Area: **Ecological Condition**
Indicator Name: **U.S. and Global Mean Temperature and Precipitation**

1. To what extent do you agree with this statement:

   This indicator is appropriate, adequate, and useful (AA&U) for evaluating ecological conditions and therefore useful for contributing to an overall picture of ecological conditions.

1	2	3	4
Indicator is not AA&U	Indicator is of somewhat AA&U	Indicator is largely AA&U	Indicator is completely AA&U

Bartell: (3)

Gregory: (4) Regional and global temperature and precipitation are critical measures of environmental change. Regardles of debates about the proximal causes of temperature change, the indicator is a critical aspect of the natgion's environment that should be tracked.

While annual rates are important, it would improve the index to also report trends in seasonal temperatures and rates of precipitation. Seasonal changes may have important consequences for critical ecological processes or biological components (e.g., juvenile fish rearing, primary production, invertebrate development). Seasonal changes also have important implication for hman activities (e.g., crop production, recreation, electricity, navigation).

Hepner: (4)

Kapustka: (4) These parameters are widely accepted as critical measurements to be charting both spatially and temporally.

2. To what extent do you agree with this statement:

   This indicator makes an important contribution[26] to answering the specific ROE question it is intended to answer (see Attachment 1 for list of questions).

1	2	3	4
Indicator is not important	Indicator is of minor importance	Indicator is important	Indicator is critical

Bartell: (3)

Gregory: (4)

[26] Note: An indicator may be judged less important if it makes a smaller or less critical contribution to answering the question posed than the other indicators, or if it covers an area of less or diminishing importance environmentally.

Hepner: (4)

Kapustka: (4) The depiction of trends by regions are particularly useful for evaluation of potential consequences on crops, non-domesticated vegetation, and wildlife associated with those cover types.

3) Please provide any additional comments, suggestions, or concerns regarding the indicator that you may have.

Bartell: Tabular summary of results, as well as some better presentation of trends and analyses would help in the presentation and interpretation of these indicators.

Gregory: [no answer provided]

Hepner: [no answer provided]

Kapustka: None.

Attachment 3: Comment Sheet for Group 2 Indicators

Topic Area: **Ecological Condition**
Indicator Name: **Ozone Levels over North America**

1. To what extent do you agree with this statement:

   This indicator is appropriate, adequate, and useful (AA&U) for evaluating ecological conditions and therefore useful for contributing to an overall picture of ecological conditions.

1	2	3	4
Indicator is not AA&U	Indicator is of somewhat AA&U	Indicator is largely AA&U	Indicator is completely AA&U

Bartell: (3)

Gregory: (4) The instrumentation and analytical methods for ozone layer detection have improved and are readily available for long-term trend monitoring. This is a critical aspect of global climate and UV exposure.

Hepner: (2) These are measurements over North America for ozone thickness of a global atmosphere? Do these measurements really indicate any trends for North America, per se, or are they more indicative of the global ozone thickness?

Kapustka: (4) This continues to be an important atmospheric parameter to track because of the human health consequences. The case for ecological consequences is less certain, but nonetheless could be a useful indicator of various potential toxic effects. This is particularly true for aquatic environments in which PAHs are prone to undergo UV enhanced photoactivation that greatly impacts photosynthetic systems and various aquatic animals.

2. To what extent do you agree with this statement:

   This indicator makes an important contribution[27] to answering the specific ROE question it is intended to answer (see Attachment 1 for list of questions).

1	2	3	4
Indicator is not important	Indicator is of minor importance	Indicator is important	Indicator is critical

Bartell: (3)

Gregory: (4)

[27] Note: An indicator may be judged less important if it makes a smaller or less critical contribution to answering the question posed than the other indicators, or if it covers an area of less or diminishing importance environmentally.

Hepner: (3)

Kapustka: (4) These data are important in tracking the long-term patterns and may be especially helpful in monitoring the rebound of stratospheric ozone following the termination of chlorofluorocarbons and halons.

3) Please provide any additional comments, suggestions, or concerns regarding the indicator that you may have.

Bartell: Needs better presentation of results...perhaps some smoothing function or other trend analysis to reduce the seasonal variability and emphasize longer-term trends…

Gregory: [no answer provided]

Hepner: The Figure 015-1 should have a line of central tendency or trend overlain on the thickness ranges.

Kapustka: None.

Attachment 3: Comment Sheet for Group 2 Indicators

Topic Area: **Ecological Condition**
Indicator Name: **Atmospheric Deposition of Mercury**

1. To what extent do you agree with this statement:

   This indicator is appropriate, adequate, and useful (AA&U) for evaluating ecological conditions and therefore useful for contributing to an overall picture of ecological conditions.

1	2	3	4
Indicator is not AA&U	Indicator is of somewhat AA&U	Indicator is largely AA&U	Indicator is completely AA&U

Bartell: (2) Failure to address dry deposition...minimal sampling stations in west and southwest...unclear relations between deposition, concentrations in water, and methylation...

Gregory: (4) The NADP monitoring program is a well-established assessment of atmospheric pollutants. The methods have been thoroughly evaluated and represent one of the most defensible measures of atmospheric pollution available.

It would seem that total mercury deposition would also be in informative indicator. The graph of the NADP data for Hg was expressed as ng/L. This could be multiplied by precipitation volume to determine the Hg deposition per hectare.

Hepner: (3) Indicator is useful as mercury contamination is being increasingly recognized as a national problem.

Kapustka: (3) The deposition of mercury has become one of the greatest concerns regarding human health in recent years. The consequences for fish and wildlife are not as well documented.

2. To what extent do you agree with this statement:

   This indicator makes an important contribution[28] to answering the specific ROE question it is intended to answer (see Attachment 1 for list of questions).

1	2	3	4
Indicator is not important	Indicator is of minor importance	Indicator is important	Indicator is critical

[28] Note: An indicator may be judged less important if it makes a smaller or less critical contribution to answering the question posed than the other indicators, or if it covers an area of less or diminishing importance environmentally.

Bartell: (3) Having an accurate and useful accounting of exposure to mercury would contribute importantly to the ROE...not sure that the wet deposition data are sufficient to estimate exposure....

Gregory: (4)

Hepner: (3)

Kapustka: (3) A potential confounding factor in the interpretation of mercury data is that good longitudinal timelines are not available. It is important to begin to build the database to track changes in deposition due to regulation of emissions.

3) Please provide any additional comments, suggestions, or concerns regarding the indicator that you may have.

Bartell: [no answer provided]

Gregory: [no answer provided]

Hepner: Would be more useful if sampling from sites in the western US was increased prior to ROE final release.

Kapustka: An unfortunate part of he monitoring component that is missing is characterization of actual or at least potential conversion rates to methyl mercury under different conditions. Also, the two figures suggest some effort toward determining some baseline condition with respect to mercury in the environment and the long-term consequences of continued deposition.

Attachment 3: Comment Sheet for Group 2 Indicators

Topic Area: **Ecological Condition**
Indicator Name: **Acid Deposition**

1. To what extent do you agree with this statement:

   This indicator is appropriate, adequate, and useful (AA&U) for evaluating ecological conditions and therefore useful for contributing to an overall picture of ecological conditions.

1	2	3	4
Indicator is not AA&U	Indicator is of somewhat AA&U	Indicator is largely AA&U	Indicator is completely AA&U

Bartell: (3)

Gregory: (4) The NADP monitoring program is a well-established assessment of atmospheric pollutants. The methods have been thoroughly evaluated and represent one of the most defensible measures of atmospheric pollution available. One of the other promising aspects of this indicator is the significant decreases in sulfate and nitrate wet deposition in recent years, most likely indicating that air quality regulations have had a positive influence on the environment.

Graphical illustration for total sulfur and nitrogen deposition could be improved.

Hepner: (3)

Kapustka: (4) Though much of the monitoring effort was curtailed when the program became less popular, there continues to be a need to extend the monitoring and evaluation of data.

2. To what extent do you agree with this statement:

   This indicator makes an important contribution[29] to answering the specific ROE question it is intended to answer (see Attachment 1 for list of questions).

1	2	3	4
Indicator is not important	Indicator is of minor importance	Indicator is important	Indicator is critical

Bartell: (3)

Gregory: (4)

[29] Note: An indicator may be judged less important if it makes a smaller or less critical contribution to answering the question posed than the other indicators, or if it covers an area of less or diminishing importance environmentally.

Hepner: (3)

Kapustka: (4) Same as above.

3) Please provide any additional comments, suggestions, or concerns regarding the indicator that you may have.

Bartell: [no answer provided]

Gregory: [no answer provided]

Hepner: Since the ecological damage is a combination of acid deposition and water, soil and parent material chemical composition (acid buffering), a graphic of an indicator merging deposition with susceptibility would be very useful to show more or less vulnerable areas.

Kapustka: None.

Attachment 3: Comment Sheet for Group 2 Indicators

Topic Area: **Ecological Condition**
Indicator Name: **Coastal Water Quality Index**

1. To what extent do you agree with this statement:

   This indicator is appropriate, adequate, and useful (AA&U) for evaluating ecological conditions and therefore useful for contributing to an overall picture of ecological conditions.

1	2	3	4
Indicator is not AA&U	Indicator is of somewhat AA&U	Indicator is largely AA&U	Indicator is completely AA&U

Bartell: (3)

Gregory: (2) The CWQI is a composite index of water chemistry and biological data. As such, interpretation is difficult. The use of regional reference conditions is warranted but added additional uncertainty. The index does not have the capacity for trend data because of the short period of record.

Hepner: (4) This indicator is very useful and appropriate to understanding the physical and chemical trends.
It is not clear as to definition of "coastal", therefore the actual areas sampled. Info states that data is both coastal and for 48 states (Figure 332-2), but some states are not coastal?

Kapustka: (3) The information that is being gathered and compiled into the index is important. The deficiency in the write-up is that the reader is expected to research the referenced documents to get the specific details on the construction of the index as well as the interpretation of results in terms of categories of high to low quality.

2. To what extent do you agree with this statement:

   This indicator makes an important contribution[30] to answering the specific ROE question it is intended to answer (see Attachment 1 for list of questions).

1	2	3	4
Indicator is not important	Indicator is of minor importance	Indicator is important	Indicator is critical

Bartell: (3)

Gregory: (2)

[30] Note: An indicator may be judged less important if it makes a smaller or less critical contribution to answering the question posed than the other indicators, or if it covers an area of less or diminishing importance environmentally.

Hepner: (4)

Kapustka: (3) Same as above.

3) Please provide any additional comments, suggestions, or concerns regarding the indicator that you may have.

Bartell: [no answer provided]

Gregory: [no answer provided]

Hepner: The indicator should be mapped by EPA region with state outlines for most citizens who do not know the EPA regions. The “condition score” needs to be explained in the legend of the Figure 332-1

Kapustka: None.

Attachment 3: Comment Sheet for Group 2 Indicators

Topic Area: **Ecological Condition**
Indicator Name: **Coastal Sediment Quality Index**

1. To what extent do you agree with this statement:

   This indicator is appropriate, adequate, and useful (AA&U) for evaluating ecological conditions and therefore useful for contributing to an overall picture of ecological conditions.

1	2	3	4
Indicator is not AA&U	Indicator is of somewhat AA&U	Indicator is largely AA&U	Indicator is completely AA&U

Bartell: (2) Some redundancy in the index (sediment toxicity and sediment contaminants expressed in terms of anticipated effects)... relevance of amphipod toxicity...lack of good seasonal coverage...

Gregory: (3) As with the CWQI, this is a composite index of sediment chemistry and biological data. As such, interpretation is difficult. The influence of regional resource managers on regional criteria also complicates the uncertainty of the value of the index. Nonetheless it combines known toxicant concentrations with well-established bioassays. The index does not have the capacity for trend data because of the short period of record.

Hepner: (2) It is not clear as to definition of "coastal", therefore the actual areas sampled. Info states that data is both coastal and for 48 states (Figure 333-2), but some states are not coastal?

Lack of assessment for Alaska and Hawaii.

Kapustka: (3) As with the previous indicator, the write-up assumes one will be familiar with the metrics or will go to the source documents to ascertain how the index is constructed and how it is evaluated.

2. To what extent do you agree with this statement:

   This indicator makes an important contribution[31] to answering the specific ROE question it is intended to answer (see Attachment 1 for list of questions).

1	2	3	4
Indicator is not important	Indicator is of minor importance	Indicator is important	Indicator is critical

Bartell: (3)

[31] Note: An indicator may be judged less important if it makes a smaller or less critical contribution to answering the question posed than the other indicators, or if it covers an area of less or diminishing importance environmentally.

Gregory: (3)

Hepner: (2)

Kapustka: (3) Same as above

3) Please provide any additional comments, suggestions, or concerns regarding the indicator that you may have.

Bartell: [no answer provided]

Gregory: [no answer provided]

Hepner: The indicator should be mapped by EPA region with state outlines for most citizens who do not know the EPA regions. The “condition score” needs to be explained in the legend of the Figure 333-1

Kapustka: None.

Attachment 3: Comment Sheet for Group 2 Indicators

Topic Area: **Ecological Condition**
Indicator Name: **Lake and Stream Acidity**

1. To what extent do you agree with this statement:

   This indicator is appropriate, adequate, and useful (AA&U) for evaluating ecological conditions and therefore useful for contributing to an overall picture of ecological conditions.

1	2	3	4
Indicator is not AA&U	Indicator is of somewhat AA&U	Indicator is largely AA&U	Indicator is completely AA&U

Bartell: (2)

Gregory: (2) ANC reflects regional geology and impacts of acid deposition. The monitoring program for ANC is regionally limited. Nonetheless, ANC reflects the vulnerability to surface waters to acid deposition and is a somewhat relevant measure of the condition of the environment in a portion of the United States that is vulnerable to acid deposition.

Hepner: (1) This indicator is not clear in its meaning and significance. As I understand it, the indicator shows the ANC, which is dependent on soils, geology and size of water body. The implication (and likely interpretation) of the indicator is that this is a useful surrogate for actual acidity measures? It is not clear that ANC is the best or even a better measure of the actual acidity or trends in acidity.

Kapustka: (3) This is a continuation of work that provided some of the initial warnings about acidification. It is very important to continue to monitor the situation.

2. To what extent do you agree with this statement:

   This indicator makes an important contribution[32] to answering the specific ROE question it is intended to answer (see Attachment 1 for list of questions).

1	2	3	4
Indicator is not important	Indicator is of minor importance	Indicator is important	Indicator is critical

Bartell: (2) Many factors can influence ANC in relation to watershed soils, chemistry, etc. limited geographic coverage... somewhat redundant to acid deposition index

Gregory: (2)

[32] Note: An indicator may be judged less important if it makes a smaller or less critical contribution to answering the question posed than the other indicators, or if it covers an area of less or diminishing importance environmentally.

Hepner: (2)

Kapustka: (3) Same as above.

3) Please provide any additional comments, suggestions, or concerns regarding the indicator that you may have.

Bartell: [no answer provided]

Gregory: [no answer provided]

Hepner: [no answer provided]

Kapustka: None.

Attachment 3: Comment Sheet for Group 2 Indicators

Topic Area: **Ecological Condition**
Indicator Name: **Extent of Hypoxia in Gulf of Mexico and Long Island Sound**

1. To what extent do you agree with this statement:

   This indicator is appropriate, adequate, and useful (AA&U) for evaluating ecological conditions and therefore useful for contributing to an overall picture of ecological conditions.

1	2	3	4
Indicator is not AA&U	Indicator is of somewhat AA&U	Indicator is largely AA&U	Indicator is completely AA&U

Bartell: (2) Limitations in the sampling for both the Gulf and Long Island Sound detract from the utility of this indicator.

Gregory: (4) Hypoxia is a major environmental indication of detrimental ecological conditions. The Gulf of Mexico integrates contributions of nutrients from the Mississippi River Basin, the largest in the coterminous United States. As similar data are developed for other coastal areas, this indicator could be expanded geographically.

Hepner: (3) Indicator is useful as a metric of nutrient pollution from large rivers into an important coastal areas. Oxygen condition reflects viability of marine ecosystems in these areas.

Kapustka: (4) Though there are multiple potential causes for the phenomenon, it is obvious that hypoxia poses a serious threat to economically valuable resources. The spatial and temporal characterization of conditions presents an important phase of gaining insight into management decisions.

2. To what extent do you agree with this statement:

   This indicator makes an important contribution[33] to answering the specific ROE question it is intended to answer (see Attachment 1 for list of questions).

1	2	3	4
Indicator is not important	Indicator is of minor importance	Indicator is important	Indicator is critical

Bartell: (3) Chronic, widespread low concentrations of dissolved oxygen pose considerable risks to aquatic species. Thus, the indicator is important, if sufficient data can be collected.

Gregory: (4)

[33] Note: An indicator may be judged less important if it makes a smaller or less critical contribution to answering the question posed than the other indicators, or if it covers an area of less or diminishing importance environmentally.

Hepner: (3)

Kapustka: (3) There needs to be more effort devoted to characterizing uncertainties ranging from sampling design and measurement errors through natural variability.

3) Please provide any additional comments, suggestions, or concerns regarding the indicator that you may have.

Bartell: [no answer provided]

Gregory: [no answer provided]

Hepner: Could graphics be made more comparable between the Long Island Sound and Gulf of Mexico analysis areas? Figure 238R-3 is too complicated given the amount of explanation of each of the lines on the figure.

Kapustka: This effort should be coupled with other measures (such as the nutrient discharge of rivers) as a means of seeking explanations for annual variations of areas affected.

Attachment 3: Comment Sheet for Group 2 Indicators

Topic Area: **Ecological Condition**
Indicator Name: **Nitrate, Phosphorus, and Pesticides in Streams in Agricultural Watersheds**

1. To what extent do you agree with this statement:

   This indicator is appropriate, adequate, and useful (AA&U) for evaluating ecological conditions and therefore useful for contributing to an overall picture of ecological conditions.

1	2	3	4
Indicator is not AA&U	Indicator is of somewhat AA&U	Indicator is largely AA&U	Indicator is completely AA&U

Bartell: (2) Limited in the number of watersheds and sampling periods... difficult to determine trends...limited number of benchmark values for pesticides...

Gregory: (3) Nitrate and soluble reactive phosphorus are important nutrients for aquatic plants. These measures are well-established measure of nutrient addition and potential contribution to eutrophication. The NAQWA program is one of the most scientifically aquatic assessment programs. The database is scientifically sound (QA/QC, peer review). The future availability of the data for trend analysis is a concern or uncertainty.

Hepner: (3) Indicator is comprehensive enough to be useful. Refinement of indicator, such as inclusion of the degree to which a pesticide exceeds guidelines, would be helpful to interpretation.

Kapustka: (2) There are good reasons to measure the loading of these agricultural discharges, but seems a bit much to combine all the pesticides with the inorganics due to the different sampling requirements, different handling, markedly different analytical procedures, and variable half-life among pesticides. Also, the large number of analytes that do not have water quality standards makes interpretation of the data difficult at best. Moreover, to evaluate potential consequences, ancillary measurements such as pH, Eh, and OM are essential.

2. To what extent do you agree with this statement:

   This indicator makes an important contribution[34] to answering the specific ROE question it is intended to answer (see Attachment 1 for list of questions).

1	2	3	4
Indicator is not important	Indicator is of minor importance	Indicator is important	Indicator is critical

[34] Note: An indicator may be judged less important if it makes a smaller or less critical contribution to answering the question posed than the other indicators, or if it covers an area of less or diminishing importance environmentally.

Bartell: (3)

Gregory: (3)

Hepner: [no answer provided]

Kapustka: (2) Same as above.

3) Please provide any additional comments, suggestions, or concerns regarding the indicator that you may have.

Bartell: [no answer provided]

Gregory: [no answer provided]

Hepner: Although this indicator is not directly related to actual condition of processed drinking water, inclusion of the EPA standard on the graphic would be useful.

Kapustka: This seems to be largely covered in other proposed indicators.

Attachment 3: Comment Sheet for Group 2 Indicators

Topic Area: **Ecological Condition**
Indicator Name: **Coastal Fish Tissue Index**

1. To what extent do you agree with this statement:

   This indicator is appropriate, adequate, and useful (AA&U) for evaluating ecological conditions and therefore useful for contributing to an overall picture of ecological conditions.

1	2	3	4
Indicator is not AA&U	Indicator is of somewhat AA&U	Indicator is largely AA&U	Indicator is completely AA&U

Bartell: (2) Limitations in spatial extent and seasonal sampling...

Gregory: (3) The summary of contaminants found in fish tissue are an indication of regional contamination from tixicants (and potential human exposure). The mix of species and size classes that are used does introduce sources of variation and uncertainty. While it is not a complete indicator of toxic exposure and availability in the environment, it does incorporate a well-established protocol for monitoring aquatic toxic contamination. Additionally it provides information about specific toxic contaminants.

Hepner: (4) This indicator appears to be a robust measure of chemical contamination affecting the food web and human health. Addition of an assessment for Alaska is important.

Kapustka: (1) The case was not made that tissue levels for the analytes are indicative of ecological effects.

2. To what extent do you agree with this statement:

   This indicator makes an important contribution[35] to answering the specific ROE question it is intended to answer (see Attachment 1 for list of questions).

1	2	3	4
Indicator is not important	Indicator is of minor importance	Indicator is important	Indicator is critical

Bartell: (3)

Gregory: (3)

Hepner: (4)

[35] Note: An indicator may be judged less important if it makes a smaller or less critical contribution to answering the question posed than the other indicators, or if it covers an area of less or diminishing importance environmentally.

Kapustka: (1) Same as above.

3) Please provide any additional comments, suggestions, or concerns regarding the indicator that you may have.

Bartell: Perhaps just show frequency distributions of results instead of combining into an index...show risk benchmark values on frequency distributions...

Gregory: [no answer provided]

Hepner: Would like to see Condition summary on a map rather than just a list of EPA regions. Why is no data available for the Great Lakes? Figure 335-2 should indicate where concentrations exceed guideline for mercury (muscle), DDT and PCB.

Kapustka: None.

General Comments for Group 1 and Group 2 Indicators

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Attachment 4: Comment Sheet for General Questions for Group 1 and 2 Indicators

Topic Area: **Ecological Condition**

1) Considering the Group 1 and 2 indicators *collectively*, do any of these indicators clearly seem to be more appropriate, adequate, or useful for evaluating ecological conditions or for establishing an overall picture of ecological conditions than others? Do any seem to be more important than the others for answering the question(s) they are intended to answer? (Note: An indicator may be judged less important if it makes a smaller or less critical contribution to answering the question posed than the other indicators or if it covers an area of diminishing interest environmentally.)

Bartell: Considered collectively, the indicators that address land-use; land cover; forest extent, type, pattern and fragmentation; wetland extent; coastal habitat; and the ecological framework seem to be more AA&U than the other indicators in addressing Question 1. The coral reef cover and Puget Sound indicators seem less AA&U in relation to Question 1.

The indicators for Question 2 emphasize birds, fish, and aquatic invertebrates. Terrestrial primary and secondary consumers are not addressed in the ROE, perhaps because many of the populations (e.g., deer) are highly managed or controlled as pests. Yet, the current limitations of the selected indicators in characterizing diversity and biological balance are daunting.

Question 3 is largely unanswered by the available indicators. Forest disturbance and N and P discharges from large rivers represent a very small subset of ecological processes necessary to sustain the Nation's ecological systems.

The indicator for Question 5 only assesses fish. Question 5 is rather inadequately addressed in the ROE.

Gregory: Ten of the indicators provide robust and environmentally important indication s of ecological or environmental conditions or major stresses: Bird Populations, Changing Streamflow, Carbon Storage in Forests, Wetland Extent and Change, Nitrogen and Phosphorus Discharges from Major Rivers, U..S. and Global Mean Temperature and Precipitation, Atmospheric Deposition of Mercury, Acid Deposition, Hypoxia in the Northern Gulf of Mexico and Long Island Sound. These ten indicators represent a mix of aquatic, terrestrial, marine and atmospheric measures. They also are based on well-established monitoring efforts with potential to reveal important trends in the environment.

Hepner: Within the indicators presented for trends in the extent and distribution of ecosystems (Q1), I believe the ecological framework, wetland extent and land use are potentially the more important.

For trends in the diversity and bio-balance (Q2), the threatened and endangered species, coastal benthic index and the pesticide resistance of anthropods are more important.

Related to Question 4 on physical and chemical attributes, carbon storage, coastal water quality and the hypoxia in the Gulf of Mexico and Long Island Sound are the more important.

Question 5 is related to trends in biomeasures of exposure. The fish tissue indices for both coastal fish and lake fish are important. This entire section could use more indicators for contamination in our food systems, such as beef cattle, and concentrations in human tissues.

Efforts should be focused to improve these indicators to be as fully adequate, appropriate and useful as possible.

Kapustka: The group of proposed indicators in Group 2 Question 1 were substantially better suited for use as national indicators. Large numbers of the other proposed indicators were too narrowly constructed to serve as useful indicators of national trends. Indeed, many appeared to be preliminary studies that were done within a single EPA Region over a short period of time and with little indication that the approach would be useful across a larger area or over an extended time.

One consistent issue that I encountered was the "one-off" nature of so many of the proposed indicators. I could not detect an overarching theme for the collection of indicators. There does not seem to have been a roadmap or a broad conceptual plan that helped organize the deliberations regarding selection of indicators.

Another concern that I developed as I read through the materials, is that many proposed indicators were synthesized from reports by others (e.g., USDA, Heinz Foundation) without any effort to provide a value-added component; not even extending the analyses from the date of publication of the reports to the current year. The abbreviated commentary extracted from these reports appeared to leave out many critical features. One wonders what the advantage might be in presenting such information as part of a fresh view of environmental conditions.

2) Are there any additional *national-level* indicators that make an important contribution to answering one of the ROE questions in your topic area, but were not proposed for ROE06, that you would recommend? (Proposed indicators should meet the ROE indicator definition and criteria, be national in scale, be of a quality that likely would pass this type of peer review, and have data that are readily available. For any new indicators proposed, provide justification for their inclusion and list references or citations for the associated underlying data sources.)

   As you consider this question, ***please read Attachment 7***, which provides the list of ecological condition and other indicators presented in ROE03 that EPA does not intend to carry forward to ROE06, along with EPA's rationale for withdrawing them. If you disagree with EPA's rationale and feel any of these indicators should be included in ROE06, please so indicate in your response to this question, along with your rationale for why they should be included. Note: The full text and graphics for the ROE03 indicators can be viewed on-line at: http://www.epa.gov/indicators/roe/html/tsd/tsdEco.htm

Bartell: A lake trophic index was removed from consideration in the ROE. However, it would seem necessary to develop some descriptor of the quality and distribution of the Nation's surface waters, other than streams and rivers. Water quality data are available from previous and continuing monitoring programs (EPA, USGS, others?) that might be used to characterize the status and trends of lakes and reservoirs throughout the U.S. Without more detailed consideration, it is not certain that all the requirements can be met as outlined for indicators used in the ROE. Yet, given the existing water quality data, including nutrients and chlorophyll, it would seem worthwhile to explore the development of such an indicator.

Gregory: The biological measures of the EMAP program and methods used by states such as Oregon are important measures of ecological conditions in aquatic ecosystems. Oregon also has used modeling approaches (similar to RIVPAKS) to identify causes of ecological impairment. The U.S. should commit to carry out these scientifically credible measures at a national scale and create more robust measures of aquatic ecosystem change that the current list of indicators provides.

Hepner: [no answer provided]

Kapustka: Absent a coherent theme, it is not useful to suggest additional metrics. In the individual indictor reviews, I mentioned expansion of several in order to achieve a broader national perspective. In some cases this entailed replicating a method across other regions; in others it was to parse the data so that known or suspected regional distinctions could be drawn.

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Comments for Group 3A Indicators

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Attachment 5: Comment Sheet for Group 3A Indicators

Topic Area (circle one): **Land Cover** or **Land Use**
Indicator Name: Land Cover

1) Please indicate the extent to which you think the proposed indicator is appropriate, adequate, and useful (AA&U) for evaluating land cover or land use and therefore useful for contributing to an overall picture of land cover or land use.

1	2	3	4
Indicator is not AA&U	Indicator is of somewhat AA&U	Indicator is largely AA&U	Indicator is completely AA&U

Bartell: (3)

Gregory: [from Group 2 response] (2) The major concerns over this indicator are 1) its extent, 2) its availability in the future for trend analysis, 3) changes in sensors and methodology in the future that may create artifacts, and 4) interpretation of the ecological implications of land cover classes (which may differ strongly in their ecological effects across the United States.

Hepner: (3) The NLCD is the most available national scale land cover data set. Land cover change is indicative of ecological conditions.
The land cover classes used may not be the optimal classes for EPAusage,

Kapustka: (2) As it currently exists, this dataset is most useful as a contextual foundation for evaluating other indicators – perhaps something analogous to a preface or an introductory environmental setting section. This is because there are no repeated measurements to establish a trend, it is simply what can be described in terms of a select number of cover classes as of 1992. It is somewhat troubling that alternative mapping efforts form some of the parameters are nearly 10 off; and that at the regional level, the variance in assigning cover types seems to be greatest (essentially having plusses cancel minuses at the national level).

2) Please indicate the extent to which you think the proposed indicator makes an important contribution to answering the specific ROE question it is intended to answer (see Attachment 1 for list of questions). (Note: An indicator may be judged less important if it makes a smaller or less critical contribution to answering the question posed than the other indicators, or if it covers an area of less or diminishing importance environmentally.)

1	2	3	4
Indicator is not important	Indicator is of minor importance	Indicator is important	Indicator is critical

Bartell: (3)

Gregory: [from Group 2 response] (3)

Hepner: (3)

Kapustka: (3) The greatest value is in establishing a baseline; assuming future re-characterization will be done. However, as some indicators traced cover categories over several decades, one wonders why the effort was limited here to pulling up only the 1992 data and not putting the effort into a comprehensive longitudinal analysis.

3) To what extent do you think the indicator meets the following indicator definition:

An "indicator" is ***a numerical value derived from actual measurements of a pressure, ambient condition, exposure, or human health or ecological condition*** *over a specified geographic domain, whose trends over time represent or draw attention to underlying trends in the condition of the environment.*

1	2	3	4
Doesn't meet the definition	Only partly meets the definition	Largely meets the definition	Fully meets the definition

Bartell: (3)

Gregory: [no answer provided]

Hepner: (2) The national land cover data set and resultant maps document the existing land cover and change, once the NLCD 2001 maps are processed. However, it is not diagnostic in the same manner as other indicators.

Kapustka: (3) The measure fails in that it represents a single year. Had the focus been on assessing the historical trends, this would be ideal. Obviously, tracing back to earlier days [i.e., before satellite coverage (~1972) or before fixed-wing aerial photography (~1933) would introduce error, but surely the generalized patterns would be evident and useful.

4) To what extent do you think the indicator meets each of the following indicator criteria:

a) The indicator makes an important contribution to answering a question for the ROE. (In this context, "important" means that the indicator answers a substantial portion of and/or a critical part of the question.)

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (2)
Gregory: (None)
Hepner: (3)
Kapustka: (2) Satisfies only spatial coverage; no temporal element available.

b) The indicator is objective. It is developed and presented in an accurate, clear, complete, and unbiased manner.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (3)
Gregory: (None)
Hepner: (3)
Kapustka: (3) Not much was described pertaining to accuracy as would be appropriate through a well-defined ground-truthing sampling strategy.

c) The underlying data are characterized by sound collection methodologies, data management systems that protect its integrity, and quality assurance procedures.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (3)
Gregory: (None)
Hepner: (3)
Kapustka: (3) Not much detail on QA.

d) Data are available to describe changes or trends, and the latest available data are timely.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (2)
Gregory: (None)
Hepner: (3)
Kapustka: (1) No temporal data; no effort to compare to earlier land cover estimates.

e) The data are comparable across time and space, and representative[36] of the target population. Trends depicted in this indicator accurately represent the underlying trends in the target population.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

[36] An indicator seeks to describe trends in an overall target "population" (e.g., land area, type of surface water, type of emissions, U.S. population), yet data often can only be sampled from a subset of this population. The validity of the trends described by the indicator will depend on the degree to which the sampled population is representative of the target population.

Bartell: (2)
Gregory: (None)
Hepner: (3)
Kapustka: (1) Fails trend information entirely.

f) The indicator is transparent and reproducible. The specific data used and the specific assumptions, analytic methods, and statistical procedures employed are clearly stated.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (3)
Gregory: (None)
Hepner: (3)
Kapustka: (2) Because new technologies are evolving rapidly, and as no effort was undertaken to develop methods to evaluate cover from different characterization methods, this is largely not repeatable.

Please explain:

Bartell: [no answer provided]

Gregory: [no answer provided]

Hepner: As noted earlier, the NLCD is a useful and available national data set. EPA should assess whether these classes used in the NLCD are the optimal ones for EPA use.

Kapustka: [see above]

5) Do you have any suggestions for more effective graphic presentation of the data? If yes, please describe.

Bartell: [no answer provided]

Gregory: [no answer provided]

Hepner: [no answer provided]

Kapustka: Show comparisons of alternative estimates to identify where the variations occur.

6) Please provide any additional comments, suggestions, or concerns regarding the indicator that you have not already noted in Questions 1 through 5. In particular, note any limitations to the indicator that you have not already described in your responses to the preceding questions.

Bartell: Merit of this indicator depends on the availability (e.g., 2006-2007) of future data in order to assess trends.

Gregory: [no answer provided]

Hepner: Once the NLCD 2001 and subsequent years are processed, a map showing areas of change of land cover would be a useful addition. Charts indicating the types of cover changes along with the maps would be informative.

Kapustka: The real value of this measurement would be to track changes over time. It is really unfortunate that no effort to compare previous land cover estimates was undertaken. Given that so much change occurred in the past 30 years, the magnitude of change is lost by picking 1992 as a baseline for future comparisons. If the concern is that previous land cover estimates were incomplete in terms of coverage, then why not establish a carefully constructed stratified sampling strategy to chart changes over long historical periods to the current condition. This indicator as described represents a missed opportunity. As is, it represents little more than a contemporary baseline.

7) Overall, this indicator:

Bartell: ___X_ Should be included in ROE06 TD.

Gregory: [no answer provided]

Hepner: ___ **X** __ Should be included in ROE06 TD.

Kapustka: __X___ Should be included in ROE06 TD with the modifications identified above

Attachment 5: Comment Sheet for Group 3A Indicators

Topic Area (circle one): **Land Cover** or **Land Use**
Indicator Name: Forest Extent and Type

1) Please indicate the extent to which you think the proposed indicator is appropriate, adequate, and useful (AA&U) for evaluating land cover or land use and therefore useful for contributing to an overall picture of land cover or land use.

1	2	3	4
Indicator is not AA&U	Indicator is of somewhat AA&U	Indicator is largely AA&U	Indicator is completely AA&U

Bartell: (3)

Gregory: [from Group 2 response] (2)

Hepner: (3) Definitions for forestland and timberland and eastern and western are not clear.

Methodology appears sound. Better imagery in recent years should improve accuracy of classification to offset fewer areas being sampled.

Kapustka: (4) This proposed indicator incorporates a wealth of historical data at macro-scales that have been aggregated by Regions and forest types.

2) Please indicate the extent to which you think the proposed indicator makes an important contribution to answering the specific ROE question it is intended to answer (see Attachment 1 for list of questions). (Note: An indicator may be judged less important if it makes a smaller or less critical contribution to answering the question posed than the other indicators, or if it covers an area of less or diminishing importance environmentally.)

1	2	3	4
Indicator is not important	Indicator is of minor importance	Indicator is important	Indicator is critical

Bartell: (3)

Gregory: [from Group 2 response] (3) This indicator is a subset of the Land Use indicator. The FIA database has been improved in recent years. It is a useful tracking of general forest conditions. Ecological interpretation of the consequences is questionable. Note the lack of substantial change since 1907, yet forest practices and ecological conditions and streams and forests have changed markedly over that century. How would this indicator reveal significant changes in forest condition in the future?

Hepner: (3)

Kapustka: (4) The long-term perspective is especially useful in evaluating contemporary trends.

3) To what extent do you think the indicator meets the following indicator definition:

An "indicator" is ***a numerical value derived from actual measurements of a pressure, ambient condition, exposure, or human health or ecological condition*** *over a specified geographic domain, whose trends over time represent or draw attention to underlying trends in the condition of the environment.*

1	2	3	4
Doesn't meet the definition	Only partly meets the definition	Largely meets the definition	Fully meets the definition

Bartell: (3)

Gregory: [no answer provided]

Hepner: (3) Does not meet the definition, but is a useful measure of ecological modification that may affect other indicators.

Kapustka: (4) The measurements are especially useful in that data can be aggregated to provide either fine resolution or course resolution across a number of parameters (e.g., area, forest type)

4) To what extent do you think the indicator meets each of the following indicator criteria:

a) The indicator makes an important contribution to answering a question for the ROE. (In this context, "important" means that the indicator answers a substantial portion of and/or a critical part of the question.)

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (3)
Gregory: (None)
Hepner: (3)
Kapustka: (4)

b) The indicator is objective. It is developed and presented in an accurate, clear, complete, and unbiased manner.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (3)
Gregory: (None)
Hepner: (3)
Kapustka: (4)

c) The underlying data are characterized by sound collection methodologies, data management systems that protect its integrity, and quality assurance procedures.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (3)
Gregory: (None)
Hepner: (3)
Kapustka: (4)

d) Data are available to describe changes or trends, and the latest available data are timely.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (3)
Gregory: (None)
Hepner: (3)
Kapustka: (4)

e) The data are comparable across time and space, and representative[37] of the target population. Trends depicted in this indicator accurately represent the underlying trends in the target population.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (3)
Gregory: (None)
Hepner: (3)
Kapustka: (4)

[37] An indicator seeks to describe trends in an overall target "population" (e.g., land area, type of surface water, type of emissions, U.S. population), yet data often can only be sampled from a subset of this population. The validity of the trends described by the indicator will depend on the degree to which the sampled population is representative of the target population.

f) The indicator is transparent and reproducible. The specific data used and the specific assumptions, analytic methods, and statistical procedures employed are clearly stated.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (3)
Gregory: (None)
Hepner: (3)
Kapustka: (4)

Please explain:

Bartell: [no answer provided]

Gregory: [no answer provided]

Hepner: The yearly output of these data are a valuable means to track changes in the forest base.

Kapustka: As a general measure of condition, the underlying data have all the key attributes one needs to undertake detailed analyses of forest conditions over regional and national scales.

5) Do you have any suggestions for more effective graphic presentation of the data? If yes, please describe.

Bartell: [no answer provided]

Gregory: [no answer provided]

Hepner: Designation of "eastern and western."
Since FIA data has most data on age, species and change geographically referenced, maps of some of these data would be more useful than bar graphs or listings by EPA region.

Kapustka: None.

6) Please provide any additional comments, suggestions, or concerns regarding the indicator that you have not already noted in Questions 1 through 5. In particular, note any limitations to the indicator that you have not already described in your responses to the preceding questions.

Bartell: [no answer provided]

Gregory: [no answer provided]

Hepner: It is unclear whether EPA Region 10 has Alaska forest and timber lands included.

Kapustka: It is important that the compilation of these data continue to be moved into GIS platforms, especially if there are ways to add links to field studies that could serve to enhance the ground-truthing and expand the coverage over time.

7) Overall, this indicator:

Bartell: __X__ Should be included in ROE06 TD.

Gregory: [no answer provided]

Hepner: [no answer provided]

Kapustka: __X__ Should be included in ROE06 TD.

Attachment 5: Comment Sheet for Group 3A Indicators

Topic Area (circle one): **Land Cover** or **Land Use**
Indicator Name: Land Use

1) Please indicate the extent to which you think the proposed indicator is appropriate, adequate, and useful (AA&U) for evaluating land cover or land use and therefore useful for contributing to an overall picture of land cover or land use.

1	2	3	4
Indicator is not AA&U	Indicator is of somewhat AA&U	Indicator is largely AA&U	Indicator is completely AA&U

Bartell: (3)

Gregory: [from Group 2 response] (2) Limitations are similar to that for Land Cover but even greater. It is useful but the ecological consequences of land uses differ greatly by region and land use type. The combination of source (NRI, FIA, NASS) introduces enormous uncertainty and sources or error. Reporting in these federal programs is uneven and has been a challenge for application within the agencies, let alone application across agencies and intended uses. The lack of information on urban and residential lands makes it even more limited.

Hepner: (2) Land use patterns are critical the evaluation of trends in ecosystems. This indicator, as implemented, is not sufficiently appropriate and adequate, therefore, not that useful. Unlike most other indicators, it is comprised of linking various data sets that were developed for different reasons. This approach provided some view of the land use change situation, but it is not ideal.

Kapustka: (3) The greatest limitation in the structure of this indicator stems from the choice of landuse categories. This reflects the missions of the USDA, the primary compilers of these data. From a broader environmental perspective, there would be benefit in adding additional categories such as parks, reserves, greenbelts, and impervious surfaces. The detail tracking by Regions over time is very useful.

2) Please indicate the extent to which you think the proposed indicator makes an important contribution to answering the specific ROE question it is intended to answer (see Attachment 1 for list of questions). (Note: An indicator may be judged less important if it makes a smaller or less critical contribution to answering the question posed than the other indicators, or if it covers an area of less or diminishing importance environmentally.)

1	2	3	4
Indicator is not important	Indicator is of minor importance	Indicator is important	Indicator is critical

Bartell: (3)

Gregory: [from Group 2 response] (3)

Hepner: (2) Land use is critical, but this ad hoc indicator is of limited use and importance.

Kapustka: (3) Same concerns as noted in 1 above.

3) To what extent do you think the indicator meets the following indicator definition:

An "indicator" is ***a numerical value derived from actual measurements of a pressure, ambient condition, exposure, or human health or ecological condition*** *over a specified geographic domain, whose trends over time represent or draw attention to underlying trends in the condition of the environment.*

1	2	3	4
Doesn't meet the definition	Only partly meets the definition	Largely meets the definition	Fully meets the definition

Bartell: (3)

Gregory: [no answer provided]

Hepner: (2)

Kapustka: (3) The concerns relate to choice of categories and resolution. The problem with borrowing data from multiple sources is that different objectives were served in the initial characterizations. It is virtually impossible to get concordant overlays spatially or temporally from data collected with different objectives in mind.

4) To what extent do you think the indicator meets each of the following indicator criteria:

a) The indicator makes an important contribution to answering a question for the ROE. (In this context, "important" means that the indicator answers a substantial portion of and/or a critical part of the question.)

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (2)
Gregory: (None)
Hepner: (2)
Kapustka: (3)

b) The indicator is objective. It is developed and presented in an accurate, clear, complete, and unbiased manner.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (3)
Gregory: (None)
Hepner: (2)
Kapustka: (3)

c) The underlying data are characterized by sound collection methodologies, data management systems that protect its integrity, and quality assurance procedures.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (2)
Gregory: (None)
Hepner: (2)
Kapustka: (3)

d) Data are available to describe changes or trends, and the latest available data are timely.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (2)
Gregory: (None)
Hepner: (2)
Kapustka: (3)

e) The data are comparable across time and space, and representative[38] of the target population. Trends depicted in this indicator accurately represent the underlying trends in the target population.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (2)
Gregory: (None)
Hepner: (1)
Kapustka: (3)

[38] An indicator seeks to describe trends in an overall target "population" (e.g., land area, type of surface water, type of emissions, U.S. population), yet data often can only be sampled from a subset of this population. The validity of the trends described by the indicator will depend on the degree to which the sampled population is representative of the target population.

f) The indicator is transparent and reproducible. The specific data used and the specific assumptions, analytic methods, and statistical procedures employed are clearly stated.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (3)
Gregory: (None)
Hepner: (2)
Kapustka: (3)

Please explain:

Bartell: [no answer provided]

Gregory: [no answer provided]

Hepner: Since data are from different sources, with different objectives, methods for classification and accuracy and error assessment, the final land cover indicator is not that reliable.

Kapustka: See response to Question 3 above.

5) Do you have any suggestions for more effective graphic presentation of the data? If yes, please describe.

Bartell: [no answer provided]

Gregory: [no answer provided]

Hepner: [no answer provided]

Kapustka: None.

6) Please provide any additional comments, suggestions, or concerns regarding the indicator that you have not already noted in Questions 1 through 5. In particular, note any limitations to the indicator that you have not already described in your responses to the preceding questions.

Bartell: The major concern lies in assessing status and trends based on a compilation of different data sources used to characterize land-use at a national scale. This limitation seems to be recognized, but it is not clear how to remedy the situation in relation to presentation and interpretation of the assessment.

Gregory: [no answer provided]

Hepner: Land use is necessarily more difficult to compile than land cover, requiring many separate data sources and classification interpretations. I would suggest this system has sufficient classification granularity for non-urban uses, but is totally inadequate for "developed." Also maps of use and use change are needed to show differential geographic impacts of land use change. Some types of change and locations (residential growth in coastal areas) are more important to the more sensitive ecosystem. This indicator lacks this information. Use one of the existing land use classifications, such as the modified Anderson system which lends itself to multiple resolutions and remote sensing data at regional scales.

EPA should develop a land use classification system that could be the basis for many of the other ecological indicators that are directly related to land use change.

Kapustka: Undertake a detailed comparison of discrepancies among different information sources to improve concordance among them (see response to Question 3 above).

7) Overall, this indicator:

Bartell: __X__ Should be included in ROE06 TD with the modifications identified above.

Gregory: [no answer provided]

Hepner: [no answer provided]

Kapustka: __X__ Should be included in ROE06 TD.

Attachment 5: Comment Sheet for Group 3A Indicators

Topic Area (circle one): **Land Cover** or **Land Use**
Indicator Name: Urbanization and Population Change

1) Please indicate the extent to which you think the proposed indicator is appropriate, adequate, and useful (AA&U) for evaluating land cover or land use and therefore useful for contributing to an overall picture of land cover or land use.

1	2	3	4
Indicator is not AA&U	Indicator is of somewhat AA&U	Indicator is largely AA&U	Indicator is completely AA&U

Bartell: (3)

Gregory: [from Group 2 response] (2) Population is a major driver of environmental change. This is an important indicator and the measures are well established.

Hepner: (3)

Kapustka: (4) The components of this indicator have major influences on most if not all of the other potential indicators. Longitudinal studies that are spatially explicit provide a solid basis for predicting future stresses from the expansion of populations in urban areas.

2) Please indicate the extent to which you think the proposed indicator makes an important contribution to answering the specific ROE question it is intended to answer (see Attachment 1 for list of questions). (Note: An indicator may be judged less important if it makes a smaller or less critical contribution to answering the question posed than the other indicators, or if it covers an area of less or diminishing importance environmentally.)

1	2	3	4
Indicator is not important	Indicator is of minor importance	Indicator is important	Indicator is critical

Bartell: (3)

Gregory: [from Group 2 response] (3)

Hepner: (3) This indicator is important and useful as currently constituted, but could be more useful if "tuned" toward ecological issues.

Kapustka: (4) The trends in population growth are critical in characterizing the state of the environment. Indeed, these generally are the most obvious of environmental stressors and the one that is typically avoided in addressing tough environmental management decisions and formulations of environmental policies.

3) To what extent do you think the indicator meets the following indicator definition:

An "indicator" is ***a numerical value derived from actual measurements of a pressure, ambient condition, exposure, or human health or ecological condition*** *over a specified geographic domain, whose trends over time represent or draw attention to underlying trends in the condition of the environment*.

1	2	3	4
Doesn't meet the definition	Only partly meets the definition	Largely meets the definition	Fully meets the definition

Bartell: (3)

Gregory: [no answer provided]

Hepner: (2)

Kapustka: (4)

4) To what extent do you think the indicator meets each of the following indicator criteria:

a) The indicator makes an important contribution to answering a question for the ROE. (In this context, "important" means that the indicator answers a substantial portion of and/or a critical part of the question.)

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (2)
Gregory: (None)
Hepner: (3)
Kapustka: (4)

b) The indicator is objective. It is developed and presented in an accurate, clear, complete, and unbiased manner.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (3)
Gregory: (None)
Hepner: (2)
Kapustka: (4)

c) The underlying data are characterized by sound collection methodologies, data management systems that protect its integrity, and quality assurance procedures.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (3)
Gregory: (None)
Hepner: (3)
Kapustka: (4)

d) Data are available to describe changes or trends, and the latest available data are timely.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (2)
Gregory: (None)
Hepner: (3)
Kapustka: (4)

e) The data are comparable across time and space, and representative[39] of the target population. Trends depicted in this indicator accurately represent the underlying trends in the target population.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (3)
Gregory: (None)
Hepner: (2)
Kapustka: (4)

f) The indicator is transparent and reproducible. The specific data used and the specific assumptions, analytic methods, and statistical procedures employed are clearly stated.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

[39] An indicator seeks to describe trends in an overall target "population" (e.g., land area, type of surface water, type of emissions, U.S. population), yet data often can only be sampled from a subset of this population. The validity of the trends described by the indicator will depend on the degree to which the sampled population is representative of the target population.

Bartell: (3)
Gregory: (None)
Hepner: (3)
Kapustka: (4)

Please explain:

Bartell: [no answer provided]

Gregory: [no answer provided]

Hepner: These data were created for purposes other than support of ecological indicators or trends in ecological conditions. Therefore, definition of attributes and classifications are based on varied objectives. Since data are drawn from separate sources and merged for the ROE, issues of comparability and reproducibility can arise.

Kapustka: None needed.

5) Do you have any suggestions for more effective graphic presentation of the data? If yes, please describe.

Bartell: [no answer provided]

Gregory: [no answer provided]

Hepner: Maps of large scale than EPA regions would be more informative. (Figure 256.3 and 256.4)

Kapustka: Add animated color graphics to track changes nationally with the capability of zooming in to sub-regional areas.

6) Please provide any additional comments, suggestions, or concerns regarding the indicator that you have not already noted in Questions 1 through 5. In particular, note any limitations to the indicator that you have not already described in your responses to the preceding questions.

Bartell: Per capita impacts of human population on condition of the environment have undoubtedly changed over time...not sure how to interpret these results in context of ecological condition...certainly population size is somehow proportional to ecological stress, but probably varies by region, as well as through time...

Gregory: [no answer provided]

Hepner: This indicator could be improved if it were made more explicit as to what types of development were taking place. Some types of urban development are more disruptive than others.

Geographic aggregation to the EPA regional level is administratively useful, but ecologically trivial. Data on population density and urban growth should be presented by watershed, county or at least state level.

Kapustka: None.

7) Overall, this indicator:

Bartell: ___X_ Should be included in ROE06 TD with the modifications identified above.

Gregory: [no answer provided]

Hepner: [no answer provided]

Kapustka: _X___ Should be included in ROE06 TD.

Comments for Group 3B Indicators

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Attachment 6: Comment Sheet for the Group 3B Indicator

Topic Area (circle one): Air
Indicator Name: Ozone Injury to Forest Plants

1) To what extent do you think the indicator meets the following indicator definition:

*An "indicator" is **a numerical value derived from actual measurements of a pressure, ambient condition, exposure, or human health or ecological condition** over a specified geographic domain, whose trends over time represent or draw attention to underlying trends in the condition of the environment.*

1	2	3	4
Doesn't meet the definition	Only partly meets the definition	Largely meets the definition	Fully meets the definition

Please explain:

Bartell: (3)

Gregory: (2) The mix of species, the determination of ozone sensitivity, the lack of complete coverage of the natiosn forests all limit the utility of this indicator. The index does not appear to depict major changes and differences between to low incidences would be difficult to interpret. There is no compelling evidence that this indicator has potential to be develop in the near future for more extensive and long-term application.

Hepner: (2)

Kapustka: (4) The indicator is an important one that provides useful information aggregated over space and time.

2) To what extent do you think the indicator meets each of the following indicator criteria:

a) The indicator makes an important contribution to answering a question for the ROE. (In this context, "important" means that the indicator answers a substantial portion of and/or a critical part of the question.)

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (2)
Gregory: (2)
Hepner: (2)
Kapustka: (3)

b) The indicator is objective. It is developed and presented in an accurate, clear, complete, and unbiased manner.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (3)
Gregory: (2)
Hepner: (2)
Kapustka: (3)

c) The underlying data are characterized by sound collection methodologies, data management systems that protect its integrity, and quality assurance procedures.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (3)
Gregory: (2)
Hepner: (3)
Kapustka: (3)

d) Data are available to describe changes or trends, and the latest available data are timely.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (3)
Gregory: (1)
Hepner: (3)
Kapustka: (3)

e) The data are comparable across time and space, and representative[40] of the target population. Trends depicted in this indicator accurately represent the underlying trends in the target population.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

[40] An indicator seeks to describe trends in an overall target "population" (e.g., land area, type of surface water, type of emissions, U.S. population), yet data often can only be sampled from a subset of this population. The validity of the trends described by the indicator will depend on the degree to which the sampled population is representative of the target population.

Bartell: (2)
Gregory: (2)
Hepner: (1)
Kapustka: (3)

f) The indicator is transparent and reproducible. The specific data used and the specific assumptions, analytic methods, and statistical procedures employed are clearly stated.

1	2	3	4
Doesn't meet this criterion at all	Only partly meets this criterion	Largely meets this criterion	Fully meets this criterion

Bartell: (2)
Gregory: (2)
Hepner: (3)
Kapustka: (3)

Please explain:

Bartell: [no answer provided]

Gregory: [no answer provided]

Hepner: The data were collected very precisely using many sites and a rigorous biosite value method. The data of over 1000 sites seems to be a rich source of ozone injury data and were likely developed in a relatively unbiased manner. However, the indicator, as presented, is a poor use of these data.

Averaging of the ozone data over such large regions is going to obliterate areas of concern. Since the focus is on forested areas, how can the regions include vast areas of the central US that are largely without forested land. This tends to skew the data presentation further.

Kapustka: The greatest difficulty with this analysis is that it is highly fickle with respect to the choice of resolution. Changing the scale of aggregation has profound impact on the spatial pattern observed. This is largely due to the placement of monitoring stations and the need to extrapolate across different scales that are influenced by different meteorological vagaries.

3) Do you have any suggestions for more effective graphic presentation of the data? If yes, please describe.

Bartell: Tabular presentation of percent of plots in addition to the bar graphs would provide more useful summary.

Gregory: [no answer provided]

Hepner: Where did these regions come from?

The data is much more spatially disaggregated than is indicated by the four regions. Map the ozone injury by areas of tree species across the US, eco-region, by county or even state. Tree species would be the most informative since two variables would be presented: injury and species.

Kapustka: Be careful about the interpretation of patterns; use different scales of aggregation.

4) Please provide any additional comments, suggestions, or concerns regarding the indicator that you have not already noted in Questions 1 through 3. In particular, note any limitations to the indicator that you have not already described in your responses to the preceding questions.

Bartell: Not sure about the interpretation of the biosite values and associated possible impacts in relation to plant mortality or growth. It's difficult to infer ecological condition from these results. Differential sensitivity among plants and different plants across regions make this index additionally challenging to interpret.

Gregory: [no answer provided]

Hepner: [no answer provided]

Kapustka: None.

5) Overall, this indicator:

Bartell: ___X__ Should *not* be included in ROE06 TD.

Gregory: _XXX_ Should *not* be included in ROE06 TD.

Hepner: [no answer provided]

Kapustka: _X___ Should be included in ROE06 TD.